PROJECT MANUAL
& SPECIFICATIONS

FOR THE ULSTER COUNTY

Government Operations Center

10 Paradies Lane, New Paltz, NY 12561

Multiple Prime Contract Project

December 20, 2024

RFB-UC24-148C

Prepared by **Urbahn Architects** 306 West 37th Street, New York, NY 10018

Alfandre Architecture 231 Main Street, New Paltz, NY 12561

Greenman-Pedersen Inc 80 Wolf Road #600, Albany, NY 12205

Cerami Associates 1155 15th Street #606, Washington DC 20005

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

00 00 50

LIST OF SPECIFICATIONS SECTIONS

DIVISION 0 BIDDING AND CONTRACT REQUIREMENTS

DIVISION 1 GENERAL REQUIREMENTS

DIVISION 2 EXISTING CONDITIONS

DIVISION 3 CONCRETE

DIVISION 4 MASONRY

DIVISION 5 METALS

DIVISION 6 WOOD, PLASTICS, AND COMPOSITES

DIVISION 7 THERMAL AND MOISTURE PROTECTION

DIVISION 8 OPENINGS

DIVISION 9 FINISHES

09 23 13	Seamless Absorptive Plaster
09 24 23	Synthetic Stucco
09 29 00	Gypsum Drywall
09 30 13	Ceramic Tiling
09 51 13	Acoustical Panel Ceiling
09 65 13	Resilient Base and Accessories
09 65 19	Resilient Tile Flooring
09 67 23	Epoxy Fluid Applied Flooring
09 68 13	Carpet Tile
09 69 00	Access Flooring
09 84 13	Acoustic Wall Panels
09 90 00	Painting and Finishing

DIVISION 10 SPECIALTIES

10 14 00	Signage
10 14 16	Plaques
10 14 53	Traffic Signage
10 14 99	Wall Graphics
10 21 13	Solid Phenolic Floor Mounted Toilet Partitions
10 22 13	Wire Mesh Partitions
10 22 26	Operable Partitions
10 26 00	Wall and Corner Protection
10 28 13	Toilet Accessories
10 44 16	Fire Extinguishers and Cabinets
10 51 13	Metal Lockers
10 51 19	Phenolic Lockers
10 56 13	Metal Storage Shelving
10 56 25	Mobile Storage Shelving
10 75 00	Flagpoles

DIVISION 11 EQUIPMENT

11 31 00	Residential Appliances
11 52 23	Audio-Visual Equipment Supports

DIVISION 12 FURNITURE

12 24 13	Window Roller Shades
12 48 16	Entrance Floor Grilles
12 50 00	Furniture by Others
12 93 00	Site Furnishings

DIVISION 21 FIRE SUPPRESSION

DIVISION 22 PLUMBING

DIVISION 23 HEATING, VENTILATION AND AIR CONDITIONING

23 08 00	Commissioning of HVAC Systems [By Owner]
23 08 65	Exhaust Fans
23 09 23	Direct Digital Control System
23 09 93	Sequence of Operations for HVAC Controls
23 20 00	HVAC Piping
23 20 06	Hydronic Specialties
23 21 13	Ground-Loop Heat-Pump Piping
23 21 23	Pumps
23 25 15	Glycol Feed System
23 31 13	Metal Ductwork
23 33 00	Ductwork Accessories
23 36 16	Variable Air Volume Units
23 37 13	Diffusers Registers and Grilles
23 37 23	Roof Ventilator
23 37 30	Louvers
23 54 13	Electric Cabinet Heater
23 54 15	Electric Unit Heater
23 73 13	Indoor Air Handling Units
23 81 24	Air Conditioners – Computer Room
23 81 46	Water Source Unitary Heat Pumps
23 81 47	Water-to-Water Heat Pump
23 84 29	Humidifiers

DIVISION 26 ELECTRICAL

26 00 00	Scope of Work
26 00 10	Basic Electrical Requirements
26 00 24	Electrical Trenching, Backfill, and Compaction
26 00 40	Identification
26 01 10	Raceways and Boxes for Electrical Systems
26 01 20	Wiring, General – 600 Volts and Under
26 01 40	Wiring Devices
26 01 90	Supporting Devices
26 01 95	Vibration and Seismic
26 03 75	Underground Conduit System
26 04 22	Service Entrance (Central Hudson Gas & Electric)
26 04 25	Switchboards
26 04 26	Double Ended Service Entrance Switchboards
26 04 50	Surge Protective Devices
26 04 51	Secondary Grounding for Buildings
26 04 70	Circuit Breakers
26 04 72	Electronic Grade Panelboards
26 04 75	Fuses
26 05 13	Medium-Voltage Cables
26 05 73	Short-Circuit/Coordination/ARC Flash Study
26 09 00	Wiring of Mechanical Equipment

DIVISION 32 EXTERIOR IMPROVEMENTS

DIVISION 33 UTILITIES

DIVISION 34 TRANSPORTATION

APPENDICES

END OF SECTION 000050

SECTION 00 01 15

LIST OF DRAWINGS

T-001 Cover Sheet
T-002 Drawing List
T-003 Abbreviations, Symbols & Legends
T-004 Accessibility Diagrams
T-005 FEMA - Flood Insurance Rate Maps (For Ref. Only)
T-006 Staging and Logistics Plan

EN-101 Energy Code Compliance
EN-102 Energy Code Compliance

R-100 Proposed Design Renderings

C-100 Site Existing Conditions Plan
C-101 Site Demolition Plan
C-102 Site Layout Plan
C-103 Grading Plan
C-104 Utility Plan
C-104.1 Utility Plan
C-104.2 Utility Plan
C-105 Landscape Plan
C-106 Erosion & Sediment Control Plan
C-501 Site Details
C-502 Site Details
C-503 Site Details
C-505 Water Details
C-506 Water Details
C-510 Sanitary Detail Sheet
C-511 Sanitary Detail Sheet
C-515 Storm Sewer Details
C-516 Storm Management Details
C-520 Landscape Details
C-525 Erosion & Sediment Control Details

A-050 Life Safety Plans & Code Analysis

A-055 Architectural Site Plan
A-060 Site Plan Details
A-061 Site Plan Details
A-100 Access Floor Level Plan

A-101 Proposed Architectural Plan
A-102 Clerestory Level
A-103 Roof Plan
A-110 Access Floor Level Plan Dimensioned
A-111 Proposed Architectural Plan Dimensioned
A-201 Exterior Elevations
A-202 Exterior Elevations
A-300 Building Sections (North & South)
A-301 Building Sections (North & South)
A-302 Building Sections (West)
A-303 Building Sections (West)
A-304 Building Sections (East)
A-305 Exterior Wall Sections
A-306 Exterior Wall Sections
A-307 Exterior Envelope Components
A-310 Foundation Details
A-311 Foundation Details
A-312 Exterior Wall Details
A-313 Exterior Wall Details
A-314 Exterior Wall Details
A-315 Exterior Wall Details
A-316 Exterior Wall Details
A-317 Exterior Wall Details
A-320 Plan Details
A-321 Plan Details
A-322 Plan Details - Column
A-323 Details
A-330 Details - Roof Plan
A-340 Entry Canopy
A-341 Entry Canopy
A-400 Equipment Coordination Plan
A-401 Reception & Vestibules
A-402 GOC Corridor
A-403 PSAP Corridor & Open Offices
A-404 Office Corridor
A-405 Service Corridor
A-406 EOC Lockers and Lunch Room
A-407 Enlarged Plans - PSAP Call Center & EOC
A-408 Enlarged Rcps - PSAP and EOC
A-409 Interior Elevs - PSAP Call Center

A-410 Interior Elevs - Emer. Operations Center
A-411 Interior Elevs - D.E.S. Director & Training Room
A-412 Interior Elevs - Command Room & G.I.S. Office
A-413 Interior Elevs - Joint Conf. Rm. & Briefing/canteen
A-414 Interior Elevs - Record Rm, Quiet Rm & Print Area
A-415 Interior Elevs - D.D./Emer. Mgt., D.D./ Fire Coord. & EMS Coord.
A-416 Interior Elevs - Conf. Secrt'y, Dep Dir. 911 & Interoperability
A-417 Interior Elevs - Storage Room & Maint. Workshop
A-418 Enlarged Plan - Server Room
A-419 Server Room Enlarged Rcp
A-420 Interior Elevs - Server Room
A-500 Enlarged Plan - Access Floor
A-601 Unisex Toilets & Janitor's Cl & Female Toilet
A-602 Female Lockers & Male Toilet / Male Lockers
A-603 Toilet Room Details
A-610 Mounting Hts & Electric Water Cooler Details
A-700 Partition Types
A-701 Details - Pedestal Access Floor
A-702 Details - Pedestal Access Floor
A-703 Details - Pedestal Access Floor
A-704 Details - Expandable Partition
A-705 Detail - Stair at Mech Equip Room
A-706 Typical Stair Details
A-710 Casework
A-711 Casework
A-712 Casework
A-801 Reflected Ceiling Plan
A-810 Typical Ceiling Details
A-811 Ceiling Details
A-812 Ceiling Details
A-813 Ceiling Details
A-814 Ceiling Details
A-815 Ceiling Details
A-816 Ceiling Details
A-900 Finishes Schedule
A-901 Room Finish Plan & Schedule
A-910 Door Frame and Types
A-911 Door Schedule
A-912 Door Details - Head and Jamb
A-913 Door Details - Threshold

A-920 Window Legend
A-921 Typical Window Details
A-922 Typical Window and Louver Details
A-925 Storefront Legend
A-929 Signage Schedule and Details
A-930 Signage Details

FF-100 Furniture Plan
FF-101 Enlarged Furniture Plans & Schedules 1
FF-102 Enlarged Furniture Plans & Schedules 2
FF-103 Enlarged Furniture Plans & Schedules 3
FF-104 Enlarged Furniture Plans & Schedules 4

S-000 Cover Sheet
S-001 General Notes
S-002 Special Inspections
S-003 C & C Loading Diagrams
S-004 C & C Loading Diagrams
S-101 Foundation Plan
S-102 Slab Plan
S-103 Low Roof Framing Plan
S-104 High Roof Framing Plan
S-401 Equipment Enclosure Plans
S-402 Equipment Enclosure Sections
S-501 Foundation Sections
S-502 Foundation Sections
S-503 Roof Framing Details
S-504 Roof Framing Details
S-505 Roof Framing Details
S-506 Roof Framing Details
S-507 Wall Sections
S-508 Wall Sections
S-510 Entry Canopy
S-511 Operable Partition Detailing
S-601 Column Schedule
S-602 Beam and Wall Schedules
S-603 Roof Joist Loading Diagrams
S-701 Typical Details
S-702 Typical Details
S-703 Typical Details
S-704 Typical Details

M-001 Mechanical Legends and Abbreviations
M-101 Mechanical Ductwork Plan
M-201 Mechanical Piping Plan
M-301 Mechanical Enlarged Plans
M-401 Mechanical Schematic Diagram
M-501 Mechanical Schedules
M-502 Mechanical Schedules
M-601 Mechanical Details
M-602 Mechanical Details

P-001 Plumbing Legend and Abbreviations
P-101 Plumbing Plan - Drainage
P-102 Plumbing Plan - Water
P-201 Plumbing Schedules
P-202 Plumbing Schedules
P-301 Plumbing Riser Diagrams and Details
P-302 Plumbing Riser Diagram and Details

FP-101 Fire Protection Plan

E-001 Electrical Legend and Abbreviations
E-002 Electrical Site Plan
E-101 Lighting Plan
E-103 Electrical Site Plan
E-201 Power Plan
E-202 Electrical Roof Plan
E-301 Systems Plan
E-401 One-line Distribution Diagram
E-501 Electrical Schedules
E-502 Electrical Schedules
E-503 Electrical Schedules
E-504 Electrical Schedules
E-601 Electrical Details
E-602 Electrical Details
E-603 Electrical Details
E-604 Electrical Details

TN-000 Telecommunications Cover Sheet
TN-001 Telecommunications Legend and General Notes
TN-100 Telecommunications Site Plan / Building Riser
TN-201 Telecommunications Plan - Finished Floor

TN-301 Telecommunications Ceiling Plan - Finished Floor
TN-302 Telecommunications Ceiling Plan - Roof
TN-401 Telecommunications Pathway Plan - Finished Floor
TN-601 Telecommunications Enlarged Plans
TN-602 Telecommunications Enlarged Plans
TY-701 Telecommunications Equipment Details

TA-000 Audiovisual Cover Sheet
TA-001 Audiovisual General Notes
TA-201 Audiovisual Overall Plan - Finished Floor
TA-301 Audiovisual Overall Rcp - Finished Floor
TA-601 Audiovisual Enlarged Plan - Training
TA-602 Audiovisual Enlarged Plan - Command Room
TA-603 Audiovisual Enlarged Plan - Conference Room
TA-604 Audiovisual Enlarged Plan - Joint Conference Room
TA-605 Audiovisual Enlarged Plan - A.V. Room
TA-606 Audiovisual Enlarged Plan - Press Briefing/Staff Canteen
TA-607 Audiovisual Enlarged Plan - Kitchenette
TA-608a Audiovisual Enlarged Plan - PSAP Call Center - South
TA-608b Audiovisual Enlarged Plan - PSAP Call Center - South
TA-608c Audiovisual Enlarged Plan - PSAP Call Center - South
TA-609 Audiovisual Enlarged Plan - PSAP Call Center - North
TA-610a Audiovisual Enlarged Plan - Emer Operations Center
TA-610b Audiovisual Enlarged Plan - Emer Operations Center
TA-611 Audiovisual Enlarged Plan - Offices
TA-801 Audiovisual System Flow Diagrams
TA-802 Audiovisual System Flow Diagrams
TA-803 Audiovisual System Flow Diagrams
TA-901 Audiovisual Equipment Rack Details

TY-000 Security Cover Sheet
TY-001 Security Legend
TY-100 Security Site Plan
TY-201 Security Plan - Finished Floor
TY-301 Security Ceiling Plan - Finished Floor
TY-302 Security Ceiling Pan - Roof
TY-701 Security Equipment Details
TY-702 Security Equipment Details

END OF SECTION 000115

SECTION 00 11 16

INVITATION TO BID AND NOTICE TO BIDDERS

DATE: 01-02-2025

NOTICE IS HEREBY GIVEN THAT SEALED BIDS ARE SOUGHT AND REQUESTED FOR THE FOLLOWING:

BID NAME: ULSTER COUNTY GOVERNMENT OPERATIONS CENTER PROJECT

BID NUMBER: **RFB-UC24-148C**

PLACE OF OPENING: **Ulster County Purchasing**
100 Development Court, Suite 400
Kingston, NY 12401

DATE OF OPENING: **February 13, 2025**

TIME OF OPENING: **3:00 PM**

CONTACT PERSON: Peter Esposito; Deputy Director of Purchasing
Phone: 845-334-5575
Email: pesp@co.ulster.ny.us

SUBMISSION: Sealed bids will be received only by the Ulster County Purchasing Dept, Peter Esposito; Deputy Director of Purchasing on or before 3:00 PM EST, February 13, 2025. Bidders are urged to submit their bid early. The bidder assumes the risk of any delay in the mail or the handling of the mail by employees of the County. Late bids will not be accepted and will be returned unopened to the bidder.

Bidders MUST submit bid in a SEALED envelope.

Please print on the face of **OUTSIDE/ MAILING** envelope:

1) NAME & ADDRESS OF BIDDER

2) BID NAME & NUMBER

3) CONTRACT BID PACKAGE (1) Bid per Trade Submitted

DIGITAL DOCUMENTS: Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at www.revplans.biddyhq.com under 'public projects' for a non-refundable reproduction fee of $49.00.

PRINTED DOCUMENTS:	Complete sets of Bidding Documents, Drawings and Specifications, may be obtained from Revplans / BiddyHQ, 28 Church Street, Suite#7, Warwick, NY 10990 Tel: 1-845-651-3845, upon depositing the sum of One Hundred dollars ($100) for each combined set of documents. Checks or money orders shall be made payable to Ulster County. Any bidder requiring documents to be shipped shall arrange with the printer and pay for all packaging and shipping costs.
IMPORTANT NOTICE:	Bid distribution - Copies of Bid Documents obtained from any source other than directly from Ulster County are not considered official copies. Only those bidders who obtain bidding documents from the designated plan house are guaranteed to receive addendum information if issued. **Prospective bidders who have obtained this document from a source other than the Designated Plan House or its website are recommended to obtain an official copy.**
PRE-BID CONFERENCE:	A pre-bid conference will be held at **10 AM local time on Monday, January 13, 2025**. Location: New Paltz Fire Department, 117 Henry W. Dubois Drive, New Paltz NY 12561. Attendance at the pre-bid conference is highly encouraged but is not mandatory.
DEPT OF LABOR REGISTRATION	**Note that Bidders are required to provide a Certification of Registration from the NYS Department of Labor in conformance with Article 8 of Labor Law Section 220-i for Public Work Projects bid on or after Dec 30, 2024** (and as directed in Section 002113 "Instructions for Bidders").

It is the Bidder's responsibility to read the attached Bid Specifications and General Conditions, which outline bidding rules of the Ulster County Purchasing Department**.** Upon submission of bid, it is understood that the Bidder has read, fully understands and will comply with said General Conditions and Specification requirements.

NOTICE

LEGAL PUBLICATIONS FOR BIDS - 2025

PLEASE BE ADVISED THAT FOR THE YEAR 2025 THE ULSTER COUNTY PURCHASING DEPARTMENT WILL PUBLISH ALL PUBLIC BIDS IN THE FOLLOWING NEWSPAPERS BY DIRECTIVE OF THE U.C. LEGISLATURE.

SHAWANGUNK JOURNAL
HUDSON VALLEY ONE

All capital projects containing materials and labor related to public works will also be published in the following trade magazines (not required by law):

New York State Contract Reporter

It is the responsibility of the prospective bidders to read these publications and contact the Ulster County Purchasing Department to obtain bid specifications.

Ulster County Purchasing Department
100 Development Court
Kingston, NY 12401

Phone: 845-340-3400
Fax: 845-340-3434

END OF ADVERTISEMENT FOR BIDS

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

PART 1 – GENERAL

1.1 SUMMARY

A. Multiple Prime Contracts are awarded for interrelated major elements of the Work that must be performed simultaneously. These projects are considered as related contracts and require close coordination of the work. Related contracts are identified in the Project Manual's Specification Section 011200 "Summary of Work – Multiple Prime Contracts."

1.2 DEFINITIONS

A. Bid Documents: Bidding Requirements and proposed Contract Documents supplemented with Invitation to Bid, Instructions to Bidders, Information available to Bidders, Bid Forms, Bid Security and Appendices.

B. Contract Documents: Include the Contract Forms between the Owner and contractor, Contractors executed bid form and supplementary Bid Forms, Conditions of the Contract (General, Supplemental and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

C. Addenda: Written graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

D. Bid: A complete and properly executed proposal to do the work for the sum(s) stipulated therein, submitted in accordance with the Bidding Documents.

1. Whenever the word "Bid" occurs in the documents, it refers to the Bidders Proposal.

2. The term "Base Bid" is an amount stated in the Bid for which the Bidder offers to perform the work described in the Bidding Documents.

3. A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

E. Unit Price: A dollar amount stated on the Bid Form as a price per unit of measurement for materials, equipment, labor to perform a service or portion of the work as described in the Bidding Documents.

1.3 ULSTER COUNTY REQUIREMENTS

A. Sustainability Requirements

1. Ulster County is firmly committed to sustainability and environmental responsibility. As directed By Executive Order #1 of 2023 (https://ulstercountyny.gov/environment/department-environment) issued by the County Executive, adherence to GreenNY sustainability requirements is now a fundamental aspect of our procurement process.

2. Ulster County has qualified to achieve certification as a New York State Green Purchasing Community. The County's sustainability initiative is designed to apply across a broad range of products and services. Suppliers are advised to review the GreenNY sustainability requirements (https://ogs.ny.gov/greenny-purchasing-requirements-and-tools), familiarize themselves with the County's initiatives aimed at mitigating the environmental footprint of its operations, and embrace the principles of environmental stewardship.

B. Compliance with Laws, Licenses, and Permits

1. The responder(s) agree that they will fully comply with all applicable Federal, State and County policies, procedures, standards and laws, rules, and regulations.

2. Vendors must submit construction documents, stamped plans, and/or specifications where required and in accordance with Title 19 NYCRR Part 1203 to the Authority Having Jurisdiction (Ulster County Safety Office).

3. Vendors must provide proof of compliance with the NYS Energy Code through a code approved Prescriptive or Performance based compliance path to the Authority Having Jurisdiction (Ulster County Safety Office).

C. Licenses and Certification

1. The contractor is responsible for ensuring all proper licenses and certifications are in-place for the workforce and equipment utilized. Any Electrical work performed, must be performed by a licensed electrician in Ulster County.

D. Apprentice Program

1. Ulster County has adopted Local Law 10 of 2022, amending the code of the County in relation to construction apprenticeships. Any contract with a value equal to or exceeding $750,000 to which the County of Ulster shall be a signatory and which involves the construction, reconstruction, improvement, rehabilitation, maintenance, repair, furnishing, equipping of or otherwise providing for any building, facility or physical structure of any kind. Contracts or subcontracts for security services are not a "construction contract" and shall not be included in the aggregate value of the contract.

2. The County of Ulster hereby requires any contractor, prior to entering into a high value construction contract with the County of Ulster, or any subcontractor entering into a contract with a contractor who has a high value construction contract with the County of Ulster, to have apprenticeship agreements appropriate for the type and scope of work to be performed, which have been registered with, and approved by, the New York State Commissioner of Labor in accordance with Article 23 of the New York State Labor Law. Such apprenticeship program must have a graduation rate of at least 30% over the last five years as determined by the New York State Department of Labor. In addition, each apprenticeship program must provide documentation verifying a minimum of three (3) trade-specific graduates per calendar year for the last five years.

3. If a specific trade required for performance of a construction contract, high value construction contract or project does not have a New York State Department of Labor-approved apprenticeship training program at the time of the opening bids for a construction contract, such contract is not subject to the provisions of this article.

4. If a single bid is received for a construction contract or high value construction contract subject to this article from a contractor that does not maintain an approved apprenticeship training program, the Director of Purchasing may elect, in his/her sole discretion, to award said contract to the single bidder rather than rebidding the construction contract or high value construction contract.

5. Notwithstanding anything in this article to the contrary, at his/her discretion, the Director of Purchasing reserves the right to accept any bid, in whole or in part, or reject all bids and readvertise in the manner outlined by §§ 101 and 103 of the General Municipal Law.

6. This article shall not apply to any construction contracts or high value construction contract utilizing federal, state, county, or other funding assistance to the extent the terms of such funding assistance precludes the application of this article.

7. This article shall not apply to any construction contract or high value construction contract where another governmental entity is also a signatory to the contract, or to an intermunicipal agreement relating to the contract, unless such other entity agrees to be bound by the provisions of this article.

E. Conflict of Interest

1. The successful bidder, by entering into a contract with Ulster County to perform or provide services or materials, covenants that it has no direct or indirect pecuniary or proprietary interest, and that it shall not acquire any such interest which conflicts in any manner or degree with the services or materials required to be performed and/or provided under the contract and that it shall not employ any person or agent having any such interests. In the event that the successful bidder or its agents, employees or representatives hereafter acquires such a conflict of

interest, it shall immediately disclose such interest to Ulster County and take action immediately to eliminate the conflict.

F. Disclosure of Ownership Interest:

Pursuant to Resolution Number 8 of 2023, the Ulster County Legislature approved a requirement of full transparency and disclosure of the name(s) of individual(s) and business entities holding ownership interest in business entities that enter into contract(s) with Ulster County. Therefore, the following information shall be disclosed, in writing, to the Ulster County Department of Purchasing and then be provided to the Chair of the Legislature and the Chair of the Ways and Means Committee, at the time a business entity submits a bid to the Ulster County Purchasing Department, or, prior to entering into written contract for such work, whichever is sooner:

1. The names of all individuals with an interest in, ownership or control of 10% or more of the profits or assets of such business entity, or of 10% of the stock in the case of a business entity that is a corporation for profit.

2. The names of all principals, partners, officers, or directors of the business entity and their immediate family members, and members of household as defined by Section 2(K) of the Ulster County Ethics Law.

3. The names of any subsidiary business entities directly or indirectly controlled by the business entity.

4. For business entities holding 10% or more of the profits or assets of a business entity seeking to do business with Ulster County, the names of all principals, partners, officers, or directors of the business entity and their immediate family members and members of household; and, be it further

RESOLVED, that the names of the individuals as set forth above shall be entered into the Ulster County financial software system, and shall be included when any resolution or contract is presented by any Ulster County department for approval by the Ulster County Legislature; and, be it further

RESOLVED, that nothing contained in this policy shall be construed as affecting the eligibility of any business entity to perform a public contract because that entity made a contribution to any committee during the one-year period immediately preceding the effective date of this act.

This information must be provided in the Disclosure of Ownership Interest Certification Form, which is included in the required forms in Section 004543 'Resolutions and Certifications.'

PART 2 – INVITATION

2.2 BID SUBMISSION

A. Sealed bids will be received only by the Ulster County Purchasing Dept, Peter Esposito; Deputy Director of Purchasing **on or before 3:00 PM EST, February 13, 2025**.

Bidders are urged to submit their bid early. The bidder assumes the risk of any delay in the mail or the handling of the mail by employees of the County. Late bids will not be accepted and will be returned unopened to the bidder.

B. Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at www.revplans.biddyhq.com under 'public projects' for a non-refundable reproduction fee of $49.00.

Complete sets of Bidding Documents, Drawings and Specifications, may be obtained from Revplans / BiddyHQ, 28 Church Street, Suite#7, Warwick, NY 10990 Tel: 1-845-651-3845, upon depositing the sum of One Hundred dollars ($100) for each combined set of documents. Checks or money orders shall be made payable to Ulster County. Any bidder requiring documents to be shipped shall arrange with the printer and pay for all packaging and shipping costs.

C. A pre-bid conference will be held at 10 AM local time on Monday, January 13, 2025. Location: New Paltz Fire Dept., 117 Henry W. Dubois Drive, New Paltz, NY 12561.

Attendance at the pre-bid conference is highly encouraged but is not mandatory.

2.3 INTENT

A. The intent of this Bid request is to obtain an offer to perform work for Ulster County, NY for a Stipulated Sum contract, in accordance with the Contract Documents.

1. The CONTRACTOR(s) will be responsible for all materials and work depicted in the Contract Documents and as required to complete the project.

2.4 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract involves new construction for a Government Operations Center off Paradies Lane in the Town of New Paltz. This project involves the construction of a new 16,350 square-foot facility that will serve Ulster County's Department of Emergency Services and Data Center. The one-story facility will include an operations center that will be used as a command center as needed during disaster events and other regional emergencies. Aspects of the overall project include road and parking improvements, an extension of water services from the Town of New Paltz, a protective enclosure for emergency generator and other electrical equipment, rooftop PV array, and ground-source heating.

2.5 PREVAILING WAGE RATES

A. The successful bidder is required to adhere to the requirements of the Federal Davis-Bacon and Related Acts and NY State Prevailing Wage Rates, whichever are higher.

B. Please be advised of upcoming important NYS Department of Labor changes.

Starting December 30, 2024, all Prime Contractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i.

Prime Contractors need to register before submitting any new bids after December 30, 2024. Subcontractors need to register before commencing new work on a covered project on or after December 30, 2024. NYSDOL encourages all contractors and subcontractors to register as soon as possible to obtain a Certificate of Registration to avoid negatively impacting a bidding period or project schedule.

In accordance with these requirements, our Public Work Projects receiving bids after 12/30/24 will require Bidders to submit a copy of their valid Certificate of Registration with their bid. Applications for registration cannot be accepted as a substitute and a Bid not accompanied by a valid NYS Department of Labor Certificate of Registration is subject to rejection.

More information on these new requirements, including NYSDOL's Contractor Registry portal, can be found on the DOL website here.
https://dol.ny.gov/contractor-and-subcontractor-landing

C. A Verified Statement of payment of Prevailing Rates (Certified Payroll Report) by the successful bidder MUST be attached to ALL invoices for payment to be made. No payments will be made for work completed if invoiced without this form.

D. NOTE: If this bid document is being downloaded from the Internet and/or if Prevailing Wage Rate information is not attached, a New York State Wage Schedule can be downloaded from
https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1580024

PART 3 – BID DOCUMENTS AND CONTRACT DOCUMENTS

3.1 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are as prepared by Architect and Engineers for Bid Number RFB-UC24-148C.

3.2 EXAMINATION

A. Upon receipt of Bid Documents, the Bidder shall study and compare with work being done by other Contractors including those identified as contractors by owner to the extent that it relates to the work for which the bid is submitted. Each Bidder shall examine and verify that documents are complete. Immediately notify Architect of any errors, inconsistencies or ambiguities discovered. All reports of such findings shall be to the Architect in writing.

3.3 INQUIRIES / ADDENDA

A. There shall be no verbal interpretation of the meaning of the Contract Documents or the scope of work, as verbal answers are not binding on any party.

B. All Bidder questions for information (RFI) regarding the meaning of the plans, specifications, or other contract documents are to be made in writing, addressed to:

Owner:	Ulster County
Attention:	Peter J Esposito; Deputy Director of Purchasing
Email:	pesp@co.ulster.ny.us

NOTE: RFI's must be received no later than **February 6, 2025 at 4:00pm**. All RFI's subject line should indicate; "RFI No. – Ulster County Government Operations Center"

C. Requests for interpretations prior to receipt of bids must be presented, in writing, to the Director of Purchasing, 100 Development Court, Kingston, NY 12401, and to be given consideration must be received by the Deputy Director of Purchasing at least seven (7) days prior to the date set for the opening of bids.

D. Any interpretation and any additional information or instruction will, if issued, be in the form of a written Addenda sent to all known holders of Contract Documents at the addresses furnished therefor at least five (5) days prior to date set for the opening of bids.

E. Addenda will be transmitted to all that are known to have received a complete set of Bidding Documents. Addenda may be issued during the bidding period to answer Bidder RFI's, provide clarifications to or modifications of the Bidding Documents. Each Bidder shall include resultant costs in their Bid Amount accordingly. All Addenda shall become part of the Contract Documents and must be acknowledged on the Bid Form.

F. Failure of any bidder to receive any Addenda shall not relieve such bidder from any obligation under this bid as submitted.

PART 4 – BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

A. Bids Shall be submitted on Bid Form provided within the project manual. Complete all requested information and appendices.

1. All blanks on the Bid Form shall be legible and executed in ink. Erasures or alterations shall be initiated in ink by the person signing the Bid Form.

2. A Bid price shall be indicated for each section, Bid item, Alternate, Unit Price and shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

B. Each Bid shall be signed by the person or persons legally authorized to bind the Bidder to a Contract and shall be signed as follows:

1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.

2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.

3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts. Under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president and secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.

4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

5. A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.

6. A Bid by an individual shall show the Bidder's name and address for receiving notices.

7. All names shall be printed in ink below the signatures.

8. The Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

9. Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

10. The Bid shall contain evidence of Bidder's authority and qualification to do business in New York State, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. The bidder's state contractor license number, if any, shall also be shown on the Bid Form.

4.2 BID SECURITY

A. A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent (5%) of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by an approved surety.

1. If a certified check or bank money order is utilized, the Bidder shall provide written confirmation from a licensed New York State Surety company that Performance and Payment Bonds will be available to said Bidder for this project.

2. If a Bid Bond is utilized, it shall be written on document AIA A310, and the attorney-in-fact that executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

B. The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails or refuses to execute and deliver the required contract security and execute a contract within fifteen (15) days after the Notice of Acceptance or Award, The Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid Security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

C. The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven (7) days after the Effective Date of the Contract or sixty (60) days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

D. If Bids are rejected by the owner, they will be released within seven (7) days after the bid opening date.

E. Bid Security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

F. Bonds must be obtained from acceptable sureties as specified in Title 31 CFR 223.

4.3 SUBMISSION OF BIDS

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

1. Bids submitted by mail shall have a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

2. If a Bidder submits for different Contracts, each shall be submitted individually and so labeled for that Contract.

B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name, Contract Bid Package and Owner's name on the outside. Executed Bid forms to be submitted are as follows:

1.	Bid Form	(see section 004116-0# 'Bid Form')
2.	Supplemental Cost Breakdown	(see Section 004150)
3.	Bid Security	(see AIA form A310 / Section 004313)
4.	Corporate Resolution	(see Section 004543)
5.	Non-Collusive Bid Affidavit	(see Section 004570)
6.	Iran Divestment Affidavit	(see Section 004590)
7.	Disclosure of Ownership Interest Certification Form	(see Section 004543)
8.	Assumed Name Certification	(see Section 004543)
9.	MacBride Fair Employment Principles	(see Section 004543)
10.	Certification of Registration with NYS Dept. of Labor	(see Article 2.5 B above)

C. Double Envelope: Insert the closed and sealed Bid Form envelope plus requested security deposit, in a large opaque envelope and label this envelope as noted above.

D. Improperly completed or missing information and irregularities in security deposit, may be the cause not to open the Bid Form envelope and declare the bid invalid or informal.

4.4 MODIFICATION OR WITHDRAWAL OF BID

A. A Bid may not be modified, withdrawn or canceled by the bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid. If a mistake was made by the Bidder and discovered after Bids were publicly opened, the Bidder shall notify the Architect and

Construction Manager immediately followed by a clear description of the mistake in writing for the Owner, Architect and Construction Manager to review for validation.

B. A Bid may be withdrawn or modified prior to the time and date designated for receipt of bids with notice given to the receiving party in writing. A withdrawn Bid can be resubmitted up to the time and date designated for receipt of Bids.

4.5 UNBALANCED BID

A. Ulster County reserves the right to reject any and all bids not deemed for the best interest of the County and to reject as informal such bids, as in its opinion, are incomplete, conditional, obscure, or which contain irregularities of any kind including unbalanced bids. An "unbalanced bid" refers to one in which the amount bid for one or more separate items is substantially out of line with current market prices for the materials and/or work covered thereby.

B. Bidders should be careful in figuring bids **prior to** submission.

4.6 ERRORS

A. Any errors in the bid award that are the fault of the County must be forwarded, in writing, to Ulster County within five (5) working days of the notification of award. No corrections will be made beyond that date. If errors on the part of the County are discovered too late to be corrected, we will issue a "no award" on those affected items and rebid or quote at a later date.

4.6 CONSIDERATION OF BIDS

A. Properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

B. The Owner shall maintain the right to reject any or all Bids. A Bid not accompanied by the required Bid Security or by other data required by the Bidding Documents, or which is in any way incomplete, or irregular may be subject to rejection.

C. It is the intent of the Owner to award Contracts to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interest.

PART 5 – POST BID REQUIREMENTS

5.1 SUPPLEMENTARY BID FORMS

A. To demonstrate Bidder's qualifications to perform the Work, the Bidder shall submit written evidence establishing its qualifications within three (3) days following the Bid Opening time. The apparent two (2) low Bidders, shall furnish to the Owner through the Construction Manager and Architect the following information:

1. Complete Contractors Qualification Statement – AIA A305 (as per Section 004513)
2. NYS Vendor Responsibility Questionnaire – to be filed or updated online at:

   https://www.osc.ny.gov/state-vendors/vendrep/file-your-vendor-responsibility-questionnaire
3. Evidence of Bidder's authority to do business in New York State.
4. Subcontractor and Supplier list (see Sections 004333 and 004336)

5.2 INSURANCE REQUIREMENTS

A. Bidders are directed to the General and Supplementary Conditions, AIA A232 Article 11, Insurance and Bonds. In conjunction with various other requirements, a Bid will not be awarded if the conditions under Article 11 are not fully satisfied.

PART 6 – NOT USED

PART 7 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OTHER WORK AT THE SITE

7.1 SITE AND OTHER AREAS

A. The site is identified in the Bidding Documents. By definition, the Site includes rights-of- way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

7.2 EXISTING SITE CONDITIONS

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. Those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site are provided with the Contract Documents.

2. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

7.3 SITE VISIT AND TESTING BY BIDDERS

A. Bidder is not required to conduct a pre-bid site visit but is strongly encouraged to do so.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

PART 8 – BIDDER'S REPRESENTATIONS

8.1 BIDDER'S RESPONSIBILITY

A. Before submitting a Bid, it is the responsibility of each Bidder to:

1. Examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents.

2. Visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

5. Consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on: (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

6. Agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

7. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

8. Promptly give Architect and Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Architect or Engineer is acceptable to Bidder;

9. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

10. Agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

PART 9 – CONTRACT TIMES

The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

PART 10 – SUBSTITUTE AND "OR EQUAL" ITEMS

A. The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute materials and equipment subsequently approved by Architect or Engineer ("AEOR") prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or- equal" or substitute unless written request for approval has been submitted by Bidder and has been received by AEOR at least fifteen (15) days prior to the date for receipt of Bids in the case of a proposed substitute and five (5) days prior in the case of a proposed "or-equal." The burden of proof of the merit of the proposed item is upon Bidder. AEOR's decision of approval or disapproval of a proposed item will be final. If AEOR approve any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

B. All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or equal" or substitution requests are made at Bidder's sole risk.

C. If an award is made, Contractor shall be allowed to submit proposed substitutes and "or equals" in accordance with General Conditions.

PART 11: SUBCONTRACTORS, SUPPLIERS, AND OTHER

A. If required by the bid documents, the apparent Successful Bidder, and any other Bidder so requested, shall within three (3) days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the Work.

B. If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or AEOR, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

C. If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or

Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in the General Conditions.

D. Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

E. The General Contractor shall not award work to Subcontractor(s) in excess of seventy-five percent (75%) of the contract price in aggregate without the written approval of the Owner.

F. The Mechanical Contractor, Electrical Contractor, Plumbing Contractor, and Site Contractor shall not award work to Subcontractor(s) in excess of fifty percent (50%) of the contract price in aggregate without the written approval of the Owner.

PART 12 – SALES & USE TAX

G. The Owner is exempt from New York State sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the bid.

PART 13 – PAYMENT PROVISIONS

A. The payment provisions in the project Specifications should allow the Owner a minimum of sixty (60) days to make payment to the Contract after the Design Professional has issued a certificate of payment.

PART 14 – WICKS LAW (GENERAL MUNICIPAL LAW SECTION 101)

A. When the entire cost of a contract for the erection, construction, reconstruction or alteration of a public building exceeds certain thresholds, the design professional must prepare the plans and specifications to allow for the independent and separate bidding and award of contracts for plumbing trade work, HVAC trade work and electrical trade work. In addition, a general construction trade contract is normally separated as well.

B. Currently, the Wicks Law's threshold amounts triggering the requirements of multiple prime contractors are:

1. $3 million in the counties of the Bronx, Kings, New York, Queens, and Richmond

2. $1.5 million in the counties of Nassau, Suffolk, and Westchester

3. $500,000 in all other counties.

C. In accordance with the provisions of Labor Law Section 222, projects that utilize a Project Labor Agreement are exempt from the multiple prime contracts' requirements of the Wicks Law.

D. For contracts that do not meet the Wicks Law threshold, the Project Specifications must require bidders to submit a separate sealed list that names each plumbing, HVAC and electrical subcontractor that the bidder will use in performance of the contract and the amount to be paid to each. This list is opened after the low bid is announced. After bid, the contractor may seek to change any listed subcontractor upon a showing of legitimate need.

END OF SECTION 002113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 31 13

CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 PROJECT SCHEDULE

A. This document is part of Procurement and Contracting Requirements for this Project. This Section is being provided to give information to Bidder's as an overview of hard milestone dates that must be adhered to by all Prime Contractors.

1.2 RELATED DOCUMENTS

A. All Contract Documents, including but not limited to, General and Supplementary Conditions of the Contract for Construction apply to this Section.

B. Refer specifically to Division 01 Sections "Multiple Contract Summary", "Submittals" and "Construction Progress Documentation" for administrative requirements.

1.3 SUMMARY

A. This Section includes a general Narrative for the Project Schedule and Project durations.

B. The Project Milestone Schedule and responsibility requirements provided under 011200, shall be used by each Prime Contractor to reference start and completion dates, and their respective durations, for each activity.

1.4 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration.

C. Milestone: A key or critical point in time for reference or measurement within the schedule timeline.

1.5 SUBMITTALS

A. Coordinated Construction Schedule(s)

1. Each Prime Contractor shall provide a construction schedule inclusive of all work tasks and coordinate into one **Master Construction Schedule** per the requirements of section 0011200.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

A. Work on site shall begin March 2025 and run continuously for 15 consecutive months through May 2026.

B. Systems Commissioning shall happen consecutively with the finishing activities of the project from April to May of 2026.

C. Contractor Punch List and Close out shall begin May 2026 through June 2026

D. Owner Vendor and Equipment Install shall take place May 2026 through July 2026

E. Refer to the Milestone Schedule at the end of Section 011200.

END OF SECTION 003113

SECTION 00 41 16.01

BID FORM – GENERAL CONTRACTOR

PART 1 – BID

1.1 TO: ULSTER COUNTY, NY

1.2 FOR: GOVERNMENT OPERATIONS CENTER

1.3 DATE:_____(Bidder to enter date)

1.4 SUBMITTED BY: (Bidder to enter name & address)

Bidder's Full Name _____

Street Address _____

City, State, ZIP _____

1.5 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

1.6 OFFER:

A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Urbahn Architects, PLLC, Alfandre Architecture, Greenman-Pederson Inc, and Cerami Associates for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____dollars ($_____),
in lawful money of the United States of America.

B. **Bid Security**: Attached hereto is Bid Security in the form of (circle correct form) Bid Bond or Certified Check in the amount of five percent (5%) of the written Base Bid amount. Bid security is irrevocable for sixty (60) days from the Bid opening date. Bid Security shall be returned to any Bids not accepted in accordance with the Instructions to Bidders.

C. **Time of Commencement and Completion**: The Bidder agrees to commence Work on the stipulated starting date(s) and will substantially complete the work in accordance with the project Milestone Schedule in specification section 003113. If the Bidder fails to obtain acceptable Insurance, Performance and Payment Bonds required to execute a Contract Agreement withing stipulated time frame under 1.5F below, the security deposit shall be forfeited as damages to Owner by reason of Bidder failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. **Rejection of Bids**: The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

E. **Execution of Contract**: If notice of the acceptance of this Bid is mailed, telegraphed, emailed or otherwise delivered to the undersigned within forty-five (45) days after the date of the Bid Opening, or any time thereafter, the undersigned will, within ten (10) days after the receipt of the form of Agreement, execute and deliver the Contract.

F. **Wage Rates**: Bidder understands compliance with the Davis-Bacon Act and other Federal Labor Standards, is mandatory for this project and to pay New York State prevailing wage rates applicable to Ulster County.

G. **Project Labor Agreement**: The Bidder understands the work of this project will require being signatory with the Project Labor Agreement (PLA) in place for this project.

H. **Site Visit**: By initiating at the end of this paragraph the Bidder acknowledges visiting the project site as requested by the Bidding Documents.

_____

(Name Printed)

1.7 **Attachments**: As itemized in the "Instructions to Bidders: for a complete Bid Form include the following ten (10) items:

a.	Bid Form	
b.	Supplemental Cost Breakdown	(Section 004150)
c.	Bid Security	(see AIA form A310 / Section 004313)
d.	Corporate Resolution	(Section 004543)
e.	Non-Collusive Bid Affidavit	(Section 004570)
f.	Iran Divestment Act Affidavit	(Section 004590)
g.	Ownership of Interest	(Section 004543)

h. Assumed Name Certification (Section 004543)
i. MacBride Fair Employment Principles (Section 004543)
j. Certificate of Registration with NYS Dept of Labor (see Section 002113 2.5 B)

1.8 **Supplementary Bid Information**: Upon the Bid Opening, the Two (2) Apparent Low Bidders shall submit in accordance with the "Instructions to Bidders" within three (3) working days the following.

a. Draft Schedule of Values (cost breakdown)
b. Proposed Subcontractors and Major Vendors List
c. Proposed Substitution List
d. Project Manager and Superintendent Resumes
e. Itemized list of work to be self-performed meeting the stipulated contract percentage requirements.
f. Complete AIA A305 Contractor Qualification Statement

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF SECTION 004116.05

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 41 16.02

BID FORM – ELECTRICAL CONTRACTOR

PART 1 – BID

1.1 TO: ULSTER COUNTY, NY

1.2 FOR: GOVERNMENT OPERATIONS CENTER

1.3 DATE:_____(Bidder to enter date)

1.4 SUBMITTED BY: (Bidder to enter name & address)

Bidder's Full Name _____

Street Address _____

City, State, ZIP _____

1.5 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

1.6 OFFER:

A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Urbahn Architects, PLLC, Alfandre Architecture, Greenman-Pederson Inc, and Cerami Associates for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____dollars ($_____),
in lawful money of the United States of America.

B. **Bid Security**: Attached hereto is Bid Security in the form of (circle correct form) Bid Bond or Certified Check in the amount of five percent (5%) of the written Base Bid amount. Bid security is irrevocable for sixty (60) days from the Bid opening date. Bid Security shall be returned to any Bids not accepted in accordance with the Instructions to Bidders.

C. **Time of Commencement and Completion**: The Bidder agrees to commence Work on the stipulated starting date(s) and will substantially complete the work in accordance with the project Milestone Schedule in specification section 003113. If the Bidder fails to obtain acceptable Insurance, Performance and Payment Bonds required to execute a Contract Agreement withing stipulated time frame under 1.5F below, the security deposit shall be forfeited as damages to Owner by reason of Bidder failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. **Rejection of Bids**: The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

E. **Execution of Contract**: If notice of the acceptance of this Bid is mailed, telegraphed, emailed or otherwise delivered to the undersigned within forty-five (45) days after the date of the Bid Opening, or any time thereafter, the undersigned will, within ten (10) days after the receipt of the form of Agreement, execute and deliver the Contract.

F. **Wage Rates**: Bidder understands compliance with the Davis-Bacon Act and other Federal Labor Standards, is mandatory for this project and to pay New York State prevailing wage rates applicable to Ulster County.

G. **Project Labor Agreement**: The Bidder understands the work of this project will require being signatory with the Project Labor Agreement (PLA) in place for this project.

H. **Site Visit**: By initiating at the end of this paragraph the Bidder acknowledges visiting the project site as requested by the Bidding Documents.

_____

(Name Printed)

1.7 **Attachments**: As itemized in the "Instructions to Bidders: for a complete Bid Form include the following ten (10) items.

a. Bid Form
b. Supplemental Cost Breakdown (Section 004150)
c. Bid Security (see AIA form A310 / Section 004313)
d. Corporate Resolution (Section 004543)
e. Non-Collusive Bid Affidavit (Section 004570)
f. Iran Divestment Act Affidavit (Section 004590)
g. Ownership of Interest (Section 004543)

h. Assumed Name Certification (Section 004543)
i. MacBride Fair Employment Principles (Section 004543)
j. Certificate of Registration with NYS Dept of Labor (see Section 002113 2.5 B)

1.8 **Supplementary Bid Information**: Upon the Bid Opening, the Two (2) Apparent Low Bidders shall submit in accordance with the "Instructions to Bidders" within three (3) working days the following.

a. Draft Schedule of Values (cost breakdown)
b. Proposed Subcontractors and Major Vendors List
c. Proposed Substitution List
d. Project Manager and Superintendent Resumes
e. Itemized list of work to be self-performed meeting the stipulated contract percentage requirements.
f. Complete AIA A305 Contractor Qualification Statement

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF SECTION 004116.05

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 41 16.03

BID FORM – MECHANICAL CONTRACTOR

PART 1 – BID

1.1 TO: ULSTER COUNTY, NY

1.2 FOR: GOVERNMENT OPERATIONS CENTER

1.3 DATE:_____(Bidder to enter date)

1.4 SUBMITTED BY: (Bidder to enter name & address)

Bidder's Full Name _____

Street Address _____

City, State, ZIP _____

1.5 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

1.6 OFFER:

A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Urbahn Architects, PLLC, Alfandre Architecture, Greenman-Pederson Inc, and Cerami Associates for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____dollars ($_____),
in lawful money of the United States of America.

B. **Bid Security**: Attached hereto is Bid Security in the form of (circle correct form) Bid Bond or Certified Check in the amount of five percent (5%) of the written Base Bid amount. Bid security is irrevocable for sixty (60) days from the Bid opening date. Bid Security shall be returned to any Bids not accepted in accordance with the Instructions to Bidders.

C. **Time of Commencement and Completion**: The Bidder agrees to commence Work on the stipulated starting date(s) and will substantially complete the work in accordance with the project Milestone Schedule in specification section 003113. If the Bidder fails to obtain acceptable Insurance, Performance and Payment Bonds required to execute a Contract Agreement withing stipulated time frame under 1.5F below, the security deposit shall be forfeited as damages to Owner by reason of Bidder failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. **Rejection of Bids**: The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

E. **Execution of Contract**: If notice of the acceptance of this Bid is mailed, telegraphed, emailed or otherwise delivered to the undersigned within forty-five (45) days after the date of the Bid Opening, or any time thereafter, the undersigned will, within ten (10) days after the receipt of the form of Agreement, execute and deliver the Contract.

F. **Wage Rates**: Bidder understands compliance with the Davis-Bacon Act and other Federal Labor Standards, is mandatory for this project and to pay New York State prevailing wage rates applicable to Ulster County.

G. **Project Labor Agreement**: The Bidder understands the work of this project will require being signatory with the Project Labor Agreement (PLA) in place for this project.

H. **Site Visit**: By initiating at the end of this paragraph the Bidder acknowledges visiting the project site as requested by the Bidding Documents.

_____

(Name Printed)

1.7 **Attachments**: As itemized in the "Instructions to Bidders: for a complete Bid Form include the following ten (10) items.

a.	Bid Form	
b.	Supplemental Cost Breakdown	(Section 004150)
c.	Bid Security	(see AIA form A310 / Section 004313)
d.	Corporate Resolution	(Section 004543)
e.	Non-Collusive Bid Affidavit	(Section 004570)
f.	Iran Divestment Act Affidavit	(Section 004590)
g.	Ownership of Interest	(Section 004543)

h. Assumed Name Certification (Section 004543)
i. MacBride Fair Employment Principles (Section 004543)
j. Certificate of Registration with NYS Dept of Labor (see Section 002113 2.5 B)

1.8 **Supplementary Bid Information**: Upon the Bid Opening, the Two (2) Apparent Low Bidders shall submit in accordance with the "Instructions to Bidders" within three (3) working days the following.

a. Draft Schedule of Values (cost breakdown)
b. Proposed Subcontractors and Major Vendors List
c. Proposed Substitution List
d. Project Manager and Superintendent Resumes
e. Itemized list of work to be self-performed meeting the stipulated contract percentage requirements.
f. Complete AIA A305 Contractor Qualification Statement

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF SECTION 004116.05

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 41 16.04

BID FORM – PLUMBING CONTRACTOR

PART 1 – BID

1.1 TO: ULSTER COUNTY, NY

1.2 FOR: GOVERNMENT OPERATIONS CENTER

1.3 DATE:_____(Bidder to enter date)

1.4 SUBMITTED BY: (Bidder to enter name & address)

Bidder's Full Name _____

Street Address _____

City, State, ZIP _____

1.5 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

1.6 OFFER:

A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Urbahn Architects, PLLC, Alfandre Architecture, Greenman-Pederson Inc, and Cerami Associates for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____dollars ($_____),
in lawful money of the United States of America.

B. **Bid Security**: Attached hereto is Bid Security in the form of (circle correct form) Bid Bond or Certified Check in the amount of five percent (5%) of the written Base Bid amount. Bid security is irrevocable for sixty (60) days from the Bid opening date. Bid Security shall be returned to any Bids not accepted in accordance with the Instructions to Bidders.

C. **Time of Commencement and Completion**: The Bidder agrees to commence Work on the stipulated starting date(s) and will substantially complete the work in accordance with the project Milestone Schedule in specification section 003113. If the Bidder fails to obtain acceptable Insurance, Performance and Payment Bonds required to execute a Contract Agreement withing stipulated time frame under 1.5F below, the security deposit shall be forfeited as damages to Owner by reason of Bidder failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. **Rejection of Bids**: The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

E. **Execution of Contract**: If notice of the acceptance of this Bid is mailed, telegraphed, emailed or otherwise delivered to the undersigned within forty-five (45) days after the date of the Bid Opening, or any time thereafter, the undersigned will, within ten (10) days after the receipt of the form of Agreement, execute and deliver the Contract.

F. **Wage Rates**: Bidder understands compliance with the Davis-Bacon Act and other Federal Labor Standards, is mandatory for this project and to pay New York State prevailing wage rates applicable to Ulster County.

G. **Project Labor Agreement**: The Bidder understands the work of this project will require being signatory with the Project Labor Agreement (PLA) in place for this project.

H. **Site Visit**: By initiating at the end of this paragraph the Bidder acknowledges visiting the project site as requested by the Bidding Documents.

_____

(Name Printed)

1.7 **Attachments**: As itemized in the "Instructions to Bidders: for a complete Bid Form include the following ten (10) items.

a.	Bid Form	
b.	Supplemental Cost Breakdown	(Section 004150)
c.	Bid Security	(see AIA form A310 / Section 004313)
d.	Corporate Resolution	(Section 004543)
e.	Non-Collusive Bid Affidavit	(Section 004570)
f.	Iran Divestment Act Affidavit	(Section 004590)
g.	Ownership of Interest	(Section 004543)

h. Assumed Name Certification (Section 004543)
i. MacBride Fair Employment Principles (Section 004543)
j. Certificate of Registration with NYS Dept of Labor (see Section 002113 2.5 B)

1.8 **Supplementary Bid Information**: Upon the Bid Opening, the Two (2) Apparent Low Bidders shall submit in accordance with the "Instructions to Bidders" within three (3) working days the following.

a. Draft Schedule of Values (cost breakdown)
b. Proposed Subcontractors and Major Vendors List
c. Proposed Substitution List
d. Project Manager and Superintendent Resumes
e. Itemized list of work to be self-performed meeting the stipulated contract percentage requirements.
f. Complete AIA A305 Contractor Qualification Statement

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF SECTION 004116.05

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 41 16.05

BID FORM – SITE CONSTRUCTION WORK

PART 1 – BID

1.1 TO: ULSTER COUNTY, NY

1.2 FOR: GOVERNMENT OPERATIONS CENTER

1.3 DATE:_____(Bidder to enter date)

1.4 SUBMITTED BY: (Bidder to enter name & address)

Bidder's Full Name _____

Street Address _____

City, State, ZIP _____

1.5 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

Addendum #_____Dated_____ Addendum #_____Dated_____

1.6 OFFER:

A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Urbahn Architects, PLLC, Alfandre Architecture, Greenman-Pederson Inc, and Cerami Associates for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____dollars ($_____),
in lawful money of the United States of America.

UNIT PRICES: The bidder affirms that all Unit Prices listed in the Bidding Documents have been included in the **Base Bid** and include overhead and profit for said Unit Price. See specification 012200, Unit Prices.

1. Unit Price **SC-UP1** (Contract No. SC-05) – Provide **500 US Tons** of Contaminated Soil Removal and Disposal.

_____ Per Ton $_____ Per Ton
(Words) (Figures)

2. Unit Price **SC-UP2** (Contract No. SC-05) – Provide **1,380 Linear Feet** of Steel Geothermal Well Casing.

_____Per Linear Foot $_____Per Linear Foot
(Words) (Figures)

B. **Bid Security**: Attached hereto is Bid Security in the form of (circle correct form) Bid Bond or Certified Check in the amount of five percent (5%) of the written Base Bid amount. Bid security is irrevocable for sixty (60) days from the Bid opening date. Bid Security shall be returned to any Bids not accepted in accordance with the Instructions to Bidders.

C. **Time of Commencement and Completion**: The Bidder agrees to commence Work on the stipulated starting date(s) and will substantially complete the work in accordance with the project Milestone Schedule in specification section 003113. If the Bidder fails to obtain acceptable Insurance, Performance and Payment Bonds required to execute a Contract Agreement withing stipulated time frame under 1.5F below, the security deposit shall be forfeited as damages to Owner by reason of Bidder failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. **Rejection of Bids**: The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

E. **Execution of Contract**: If notice of the acceptance of this Bid is mailed, telegraphed, emailed or otherwise delivered to the undersigned within forty-five (45) days after the date of the Bid Opening, or any time thereafter, the undersigned will, within ten (10) days after the receipt of the form of Agreement, execute and deliver the Contract.

F. **Wage Rates**: Bidder understands compliance with the Davis-Bacon Act and other Federal Labor Standards, is mandatory for this project and to pay New York State prevailing wage rates applicable to Ulster County.

G. **Project Labor Agreement**: The Bidder understands the work of this project will require being signatory with the Project Labor Agreement (PLA) in place for this project.

H. **Site Visit**: By initiating at the end of this paragraph the Bidder acknowledges visiting the project site as requested by the Bidding Documents.

_____

(Name Printed)

1.7 **Attachments**: As itemized in the "Instructions to Bidders: for a complete Bid Form include the following ten (10) items.

a.	Bid Form	
b.	Supplemental Cost Breakdown	(Section 004150)
c.	Bid Security	(see AIA form A310 / Section 004313)
d.	Corporate Resolution	(Section 004543)
e.	Non-Collusive Bid Affidavit	(Section 004570)
f.	Iran Divestment Act Affidavit	(Section 004590)
g.	Ownership of Interest	(Section 004543)
h.	Assumed Name Certification	(Section 004543)
i.	MacBride Fair Employment Principles	(Section 004543)
j.	Certificate of Registration with NYS Dept of Labor	(see Section 002113 2.5 B)

1.8 **Supplementary Bid Information**: Upon the Bid Opening, the Two (2) Apparent Low Bidders shall submit in accordance with the "Instructions to Bidders" within three (3) working days the following.

a. Draft Schedule of Values (cost breakdown)
b. Proposed Subcontractors and Major Vendors List
c. Proposed Substitution List
d. Project Manager and Superintendent Resumes
e. Itemized list of work to be self-performed meeting the stipulated contract percentage requirements.
f. Complete AIA A305 Contractor Qualification Statement

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

SECTION 00 41 50

SUPPLEMENTAL COST BREAKDOWN

PART 1 – PARTICULARS / BASE BID

1.1 THE FOLLOWING is a COST BREAKDOWN referenced in the BID submitted by:

BIDDER: _____

TO: Ulster County (Owner)

DATED: _____ and which is an integral part of the Bid Form.

PART 2 – ITEM DESCRIPTIONS

Each Bidder shall provide a Cost Breakdown with a preliminary Schedule of Values. The form and content of the Supplemental Cost Breakdown shall conform with Section 01299 'Payment Procedures' Article 1.3.C and shall include line-item amounts for:

- General Requirements (Division 01) ;
- For each applicable Division thereafter (separately by Division)
- Subtotal
- Overhead & Profit
- Total

END OF SECTION 004150

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

BOND AMOUNT:

PROJECT:
(Name, location or address, and Project number, if any)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of

(Witness)	*(Contractor as Principal)*	*(Seal)*
	(Title)	
(Witness)	*(Surety)*	*(Seal)*
	(Title)	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 25

SUBSTITUTION REQUEST FORM

Should any part or portion of the Work be planned for substitute products, list all substitutes that are proposed for products that have been specified by one or more manufacturers named in the specification. Please print in ink or type in the spaces provided. Attach additional sheets if necessary.

This identification of substitutions is required of low Bidder as part of the Bid Forms. Substitutions may affect Owner's acceptance of the Bid and decision to award Contract. Additional data on substitutions may be requested from selected Bidders after Bid opening in accordance with the Instructions to Bidders.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

END OF SECTION 004325

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 30

VERIFIED STATEMENT OF PREVAILING WAGES - CONTRACTOR

PRC _____ ULSTER COUNTY

Date _____ To

BID or QUOTE # _____

1. _____ (Name of person making statement), being the _____ (Owner or if Corporation, the title of such officer) of _____ (Full name of Corporation) files this Verified Statement pursuant to Section 220-a of the Labor Law.

2. This Verified Statement involves the Ulster County Government Operations Center off Paradies Lane in the Town of New Paltz, NY (Contract number _____).

3. Except as stated herein, there are not amounts due and owing to or on behalf of workers employed on the project by the Contractor. (Set forth any unpaid wages and supplements, and if necessary, attach additional sheets. If none, so state).

4. The Contractor hereby files every verified statement required to be obtained by the Contractor from the subcontractor and the same are attached hereto.

5. Upon information and belief, except as stated herein, all workers of subcontractor (exclusive of executive or supervisory employees) employed on the project have been paid the prevailing wages and supplements for their services through _____, the last day worked on the project by their subcontractor: (Set forth any unpaid wages and supplements, and if necessary, attach additional sheets. If none, so state and utilize clause SA).

NAME	AMOUNT

A. The Contractor has no knowledge of amounts owing to or on behalf of any workers.

6. In the event it is determined by the Commissioner of Labor that the wages or supplements or both of any such subcontractors have not been paid or provided pursuant to the appropriate schedule of wages and supplements, then the Contractor acknowledges that it shall be responsible for payment of which wages and supplements pursuant to the provision of Section 223 of the Labor Law.

END OF SECTION 004330

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 33

MATERIAL AND EQUIPMENT SUPPLIERS LISTING

List the name(s) of the supplier and manufacturer if different, that Bidder(s) proposes for all major material and equipment in the Contract. Please print in ink or type in the spaces provided. Attach additional sheets if necessary.

This identification of suppliers is a requirement of the low Bidder as part of Supplementary Bid Forms and is in partial fulfillment of the Instructions to Bidders. Additional data on proposed suppliers may be requested from selected Bidder(s) after the Bid opening in accordance with the Instructions to Bidders.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

END OF SECTION 004333

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 36

PROPOSED SUBCONTRACTOR LIST

Should any part or portion of the Work be planned for subcontracting, list the name and address of all Subcontractors that Bidder proposes to use on this Contract and the Work assigned to each. Please print in ink or type in the spaces provided. Attach additional sheets if necessary.

This identification of subcontractors is required of low Bidders as part of the Bid and is in partial fulfillment of requirements in Article 6 of the Instructions to Bidders. Additional data on proposed Subcontractors may be requested from selected Bidders after the Bid Opening in accordance with Article 6 of the Instructions to Bidders.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

END OF SECTION 004333

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 40

SUPPLIMENT D – PREVAILING WAGE RATES

PART 1 PARTICULARS

1. All personnel performing work on Ulster County owned or operated facilities will be compensated as per the New York State Department of Labor's Schedule of Prevailing Wage Rates for Ulster County for the trades *I* worker classifications anticipated for this project work.

2. These wage rates apply to all public works contracting in the State of New York, in accordance with Article 8 (Section 220 - 223) and Article 9 (Section 230 - 239) of the New York State Labor Law.

3. Failure to pay the requisite prevailing wages or supplements may cause to be withheld from payment due the prime contractor an amount indicated by the Bureau of Public Work as sufficient to satisfy the unpaid wages and supplements, Including Interest and any civil penalty that may be assessed by the Commissioner of Labor.

4. Contractors are required to post the schedule of prevailing wage rates on the jobsite and provide copies of the schedule to all their contractors. Contactors must obtain affidavits from the subcontractors that schedules have been provided.

5. The Prevailing Rate Case number ISD PRC# 2024014555 – Ulster County Government Operations Center on https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1580024

END OF SECTION 004340

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 43 60 – FEDERAL LABOR STANDARDS

HUD-4010
Federal Labor Standards Provisions

U.S. Department of Housing and Urban Development
Office of Davis-Bacon and Labor Standards

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

1. Minimum wages and fringe benefits

i. All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in 29 CFR 5.5(d) and (e), the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(v) of these contract clauses; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under 29 CFR 5.5(a)(1)(iii)) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

ii. Frequently recurring classifications

A. In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to 29 CFR 5.5(a)(1)(iii), provided that:

1. The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

2. The classification is used in the area by the construction industry; and

3. The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

B. The Administrator will establish wage rates for such classifications in accordance with 29 CFR 5.5(a)(1)(iii)(A)(3). Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

iii. Conformance

A. The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be

classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

1. The work to be performed by the classification requested is not performed by a classification in the wage determination; and

2. The classification is used in the area by the construction industry; and

3. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

B. The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

C. If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

D. In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

E. The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under 29 CFR 5.5 (a)(1)(iii)(C) and (D). The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to 29 CFR 5.5 (a)(1)(iii)(C) or (D) must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

iv. Fringe benefits not expressed as an hourly rate

Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

v. Unfunded plans

If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in 29 CFR 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

vi. Interest In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding

i. Withholding requirements

The U. S. Department of Housing and Urban Development may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in 29 CFR 5.5(a) for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work (or otherwise working in construction or development of the project under a development statute) all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in 29 CFR 5.5(a)(3)(iv), HUD may on its own initiative and after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

ii. Priority to withheld funds

The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:

- **A.** A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- **B.** A contracting agency for its reprocurement costs;
- **C.** A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- **D.** A contractor's assignee(s);
- **E.** A contractor's successor(s); or
- **F.** A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.

3. Records and certified payrolls

i. Basic record requirements

- **A. Length of record retention.** All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.
- **B. Information required** Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.
- **C. Additional records relating to fringe benefits**. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(v) that the wages of any laborer or mechanic include the amount of any

costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

D. Additional records relating to apprenticeship Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

ii. Certified payroll requirements

A. Frequency and method of submission The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to HUD if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the certified payrolls to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system

B. Information required The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i)(B), except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.*, the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the sponsoring government agency (or the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records).

C. Statement of Compliance Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

1. That the certified payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information and basic records are being maintained under 29 CFR 5.5 (a)(3)(i), and such information and records are correct and complete;

2. That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly

from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

D. Use of Optional Form WH-347 The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by 29 CFR 5.5(a)(3)(ii)(C).

E. Signature The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

F. Falsification The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

G. Length of certified payroll retention The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iii. Contracts, subcontracts, and related documents The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iv Required disclosures and access

A. Required record disclosures and access to workers The contractor or subcontractor must make the records required under 29 CFR 5.5(a)(3)(i)–(iii), and any other documents that HUD or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by 29 CFR 5.1, available for inspection, copying, or transcription by authorized representatives of HUD or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

B. Sanctions for non-compliance with records and worker access requirements If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to 29 CFR 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

C. Required information disclosures Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to HUD if the agency is a party to

the contract, or to the Wage and Hour Division of the Department of Labor. If the Federal agency is not such a party to the contract, the contractor, subcontractor, or both, must, upon request, provide the full Social Security number and last known address, telephone number, and email address of each covered worker to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity

i. Apprentices

A. Rate of pay Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

B. Fringe benefits Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

C. Apprenticeship ratio The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to 29 CFR 5.5(a)(4)(i)(D). Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in 29 CFR 5.5(a)(4)(i)(A), must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

D. Reciprocity of ratios and wage rates Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

ii Equal employment opportunity The use of apprentices and journeyworkers under this part must be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

5 Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6 Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (11), along with the applicable wage determination(s) and such other clauses or contract modifications as the U.S. Department of Housing and Urban Development may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate.

7 Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8 Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9 Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

i. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

ii. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

iii. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11 Anti-retaliation It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

i. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

ii. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

iii. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5; or

iv. Informing any other person about their rights under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5.

B. Contract Work Hours and Safety Standards Act (CWHSSA)

The Agency Head must cause or require the contracting officer to insert the following clauses set forth in 29 CFR 5.5(b)(1), (2), (3), (4), and (5) in full, or (for contracts covered by the Federal Acquisition Regulation) by reference, in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses must

be inserted in addition to the clauses required by 29 CFR 5.5(a) or 4.6. As used in this paragraph, the terms "laborers and mechanics" include watchpersons and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in 29 CFR 5.5(b)(1) the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchpersons and guards, employed in violation of the clause set forth in 29 CFR 5.5(b)(1), in the sum of $31 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in 29 CFR 5.5(b)(1).
3. **Withholding for unpaid wages and liquidated damages**

i. **Withholding process** The U.S Department of Housing and Urban Development or the recipient of Federal assistance may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in 29 CFR 5.5(b) on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

ii **Priority to withheld funds** The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:

- **A.** A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- **B.** A contracting agency for its reprocurement costs;
- **C.** A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- **D.** A contractor's assignee(s);
- **E.** A contractor's successor(s); or
- **F.** A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.

4. ***Subcontracts.*** The contractor or subcontractor must insert in any subcontracts the clauses set forth in 29 CFR 5.5(b)(1) through (5) and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in 29 CFR 5.5(b)(1) through (5). In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss,

due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5 **Anti-retaliation** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

- **i.** Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in 29 CFR part 5;
- **ii.** Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or 29 CFR part 5;
- **iii.** Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or 29 CFR part 5; or
- **iv.** Informing any other person about their rights under CWHSSA or 29 CFR part 5.

C. **CWHSSA required records clause** In addition to the clauses contained in 29 CFR 5.5(b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other laws referenced by 29 CFR 5.1, the Agency Head must cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor must maintain regular payrolls and other basic records during the course of the work and must preserve them for a period of 3 years after all the work on the prime contract is completed for all laborers and mechanics, including guards and watchpersons, working on the contract. Such records must contain the name; last known address, telephone number, and email address; and social security number of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid; daily and weekly number of hours actually worked; deductions made and actual wages paid. Further, the Agency Head must cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph must be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview workers during working hours on the job.

D. **Incorporation of contract clauses and wage determinations by reference** Although agencies are required to insert the contract clauses set forth in this section, along with appropriate wage determinations, in full into covered contracts, and contractors and subcontractors are required to insert them in any lower-tier subcontracts, the incorporation by reference of the required contract clauses and appropriate wage determinations will be given the same force and effect as if they were inserted in full text.

E. **Incorporation by operation of law** The contract clauses set forth in this section (or their equivalent under the Federal Acquisition Regulation), along with the correct wage determinations, will be considered to be a part of every prime contract required by the applicable statutes referenced by 29 CFR 5.1 to include such clauses, and will be effective by operation of law, whether or not they are included or incorporated by reference into such contract, unless the Administrator grants a variance, tolerance, or exemption from the application of this paragraph. Where the clauses and applicable wage determinations are effective by operation of law under this paragraph, the prime contractor must be compensated for any resulting increase in wages in accordance with applicable law.

F. HEALTH AND SAFETY

The provisions of this paragraph (F) are applicable where the amount of the prime contract exceeds **$100,000**.

1. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
2. The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.
3. The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

END OF SECTION 004370

SECTION 00 45 13 – QUALIFICATIONS STATEMENT

AIA® Document A305® – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

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

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

- ☐ Exhibit A – General Information
- ☐ Exhibit B – Financial and Performance Information
- ☐ Exhibit C – Project-Specific Information
- ☐ Exhibit D – Past Project Experience
- ☐ Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

NOTARY
State of:
County of:
Signed and sworn to before me this day of

_____
Notary Signature

My commission expires:

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 45 43

RESOLUTIONS AND CERTIFICATIONS

PART 1 – GENERAL

1.1 FORMS DUE WITH BID SUBMISSION (Attached)

A. In conformance with Section 002213 'Instructions to Bidders' Article 4.3 and along with their Bid Form, Supplemental Bid Cost Breakdown, Bid Security (AIA A310), and Certificate of Registration with the New York State Department of Labor, all Bidders shall complete the following forms and submit by the specified deadline:

1.	Corporate Resolution	(attached)
2.	Disclosure of Ownership Interest Certification	(attached)
3.	Assumed Name Certification	(attached)
4.	MacBride Fair Employment Principles	(attached)

1.2 RELATED SECTIONS (Other forms due with Bid Submission):

1.	Certification and Signature Form - Affidavit of Non-Collusion	Section 004570
2.	Certification of Compliance with the Iran Divestment Act	Section 004590

PART 2 – PARTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 004543

BID NO. **RFB-UC24-148C**

INCLUDE WITH BID FORM(S) IF BIDDER IS AN INDIVIDUAL:

BY: _____

(Signature)

_____

(Print or type individual's name and title)

_____

(Business Address)

_____

Business Phone Facsimile

BID NO. **RFB-UC24-148C**

INCLUDE WITH BID FORM(S) IF BIDDER IS A PARTNERSHIP:

_____

(Print or type name of firm)

BY: _____

(Signature of general partner)

_____

(Print or type general partner's name and title)

_____

(Business Address)

_____

Business Phone Facsimile

BID NO. **RFB-UC24-148C**

INCLUDE WITH BID FORM(S) IF BIDDER IS A CORPORATION:

_____

(Print or type name of corporation)

_____

(State of incorporation)

BY: _____

(Signature of president or vice-president)

_____

(Print or type individual's name and title)

_____

(Business Address)

_____

Business Phone Facsimile

ATTEST:

_____

(By corporate secretary or assistant secretary)

_____

(Print name and title)

Corporate Seal

BID NO. **RFB-UC24-148C**

DISCLOSURE OF OWNERSHIP INTEREST CERTIFICATION FORM

Pursuant to Ulster County Resolution Number 8 of 2023, please list the following information (if necessary, use additional sheets):

1. The names of all individuals with an interest in, ownership or control of 10% or more of the profits or assets of _____ ("the Company") seeking to do business with Ulster County, or individuals owning or controlling 10% or more of the stock of said business in the case of a business entity that is a for profit corporation.

_____

_____

_____

_____

_____

_____

2. The names of all principals, partners, officers, or directors of the Company seeking to do business with Ulster County and their immediate family members and members of household.

_____

_____

_____

_____

_____

_____

3. The names of any subsidiary business entities directly or indirectly controlled by Company.

_____

_____

_____

_____

_____

BID NO. **RFB-UC24-148C**

4. For business entities holding 10% or more of the profits or assets of the Company, the names of all principals, partners, officers, or directors of that business entity and their immediate family members and members of household.

INITIALS: _____

BID NO. **RFB-UC24-148C** **BIDDER NAME:** _____

ASSUMED NAME CERTIFICATION

*If the business is conducted under an assumed name, a copy of the certificate required to be filed under the New York general business law must be attached.

ASSUMED NAME:_____

If the bidder is an individual, the bid must be signed by that individual; if the bidder is a corporation, by an officer of the corporation, or other person authorized by resolution of the board of directors, and in such case a copy of the resolution must be attached; if a partnership, by one of the partners or other person authorized by a writing signed by at least one general partner and submitted with the bid or previously filed with the Director of Purchasing.

"The submission of this constitutes a certification that no County Officer has any interest therein. (Note: In the event that any County Officer has any such interest, the full nature thereof should be disclosed below.)"

_____

_____

_____

_____

_____

_____
AUTHORIZED SIGNATURE

_____
PRINT NAME

BID NO. **RFB-UC24-148C** **BIDDER NAME:**_____

MACBRIDE FAIR EMPLOYMENT PRINCIPLES

Ulster County Resolution 108 of March 8, 2001, in an attempt to prevent discrimination in all forms, provides the requirement that vendors who do business with Ulster County read, initial and return the attached statement as part of their official document.

Please read and initial **either** Statement #1 or Statement #2.

DO NOT INITIAL BOTH STATEMENTS.

___1. The Bidder, and any individual or legal entity in which the Bidder holds a 10% or greater ownership interest and any individual or legal entity that holds a 10% or greater ownership interest in the Bidder, has no business operations in Northern Ireland.

___2. The Bidder, and any individual or legal entity in which the Bidder holds a 10% or greater ownership interest and any individual or legal entity that holds a 10% or greater ownership interest in the Bidder shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Fair Employment Principles and shall permit the independent monitoring of their compliance with such principles.

_____
AUTHORIZED SIGNATURE

_____
PRINT NAME:

SECTION 00 45 70

NON-COLLUSIVE CERTIFICATION

General Municipal Law – Public Contracts, Article 5-A must be in the documents and paperclipped for review.

§103-d. Statement of non-collusion in bids and proposals to political subdivision of the state

Every bid or proposal hereafter made to a political subdivision of the state or any public department, agency or official thereof where competitive bidding is required by statute, rule, regulation or local law, for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed by the bidder and affirmed by such bidder as true under the penalties of perjury: Non-collusive bidding certification.

"(a) By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, at to any matter relating to such prices with any other bidder or with any competitor; and

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and

3. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition."

BUSINESS NAME (print) _____

BIDDER (print) _____

BIDDER (signature) _____

Business Address: _____

_____

Telephone: _____

Date of Proposal: _____

END OF SECTION 004570

SECTION 00 45 90

IRANIAN DIVESTMENT CERTIFICATION

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

Pursuant to State Finance Law §165-a, on August 10, 2012 the Commissioner of the Office of General Services (OGS) posted a prohibited entities list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf

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 penalty of 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 § 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 at the time 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 County receive information that a Bidder/Contractor is in violation of the above-referenced certification, the County 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 County 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 County reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the 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 and says that I am 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 _____ 202__

Notary Public: _____

END OF SECTION 0042590

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 52 23 — AGREEMENT FORM

AIA® Document A132® – 2019

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

Ulster County Contract No. _____-_____
AGREEMENT made as of the day of in the year 20__
(In words, indicate day, month, and year.)

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

County of Ulster
244 Fair Street
P.O. Box 1800
Kingston, New York 12401

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

TBD

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

Ulster County Government Operations Center RFB-UC__-XXXXC
Paradies Lane
New Paltz, New York 12561

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

The Palombo Group
22 Noxon Road
Poughkeepsie, New York 12601

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

Urbahn Architects PLLC
306 West 37th Street, 9th Floor
New York New York 10018

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

§ 2.1 The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents.

§ 2.2 Except as expressly provided for in the Contract Documents to the contrary, the Contractor, at its sole cost, risk, and expense, shall construct, equip, provide purchase, pay for, and furnish all of the Work in accordance with the Contract Documents and governmental codes and regulations as they apply to performance of the Work.

§ 2.3 The Owner shall retain the right to review and make revisions to any subcontracts entered into between the Contractor and any Subcontractors to ensure that the Work being provided for the project is consistent with the terms and obligations of the prime contract and the Owner's wishes for the project. The Owner also reserves the right to appoint a Construction Manager and/or Architect to make changes to the Work being provided for the project which may be necessary to satisfy the Owner's expectations or to keep the project's timetable.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

«Date of Commencement shall be fixed in the Owner's notice to proceed, which is anticipated to be on or about June 1, 2020.»

If, prior to the commencement of the Work, the Owner requires time to file mortgages, mechanics' liens and other security interests, the Owner's time requirement shall be as follows:

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

§ 3.2.1 Substantial Completion occurs when the Architect certifies that the Owner can occupy or use the project and a certificate of occupancy has been issued.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than «_____» («») days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

Portion of the Work	Substantial Completion Date
Substantial Completion Phase of the Project /including Owner Occupancy Punchlist Phase Shall be complete within 30 days of receipt from the Architect/Engineer with the exception of weather dependent punch list items such as final seeding, asphalt, etc. All punchlist items shall be complete by Project Closeout Phase	

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

« »

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

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below. Based on the selection above, also complete either Section 5.1.4, 5.1.5 or 5.1.6 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Stipulated Sum shall be XXXX, AND 00/100 DOLLARS ($ XXXX), subject to additions and deletions as provided in the Contract Documents.

§ 4.2.2 The Stipulated Sum is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

«

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

§ 4.2.4 Allowances included in the Stipulated Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment (including all supporting documentation) submitted to the Owner, the Architect, and the Construction Manager by the Contractor, and upon certification of the Project Application and Project Certificate for Payment or Application for Payment and Certificate for Payment by the Construction Manager and Architect and issuance by the Architect, and review and approval by the Owner, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

.1 The Contractor's invoice shall contain, or have attached, sufficient supporting detail as reasonably required by the County to verify the claim, including:

.1 Reporting of wages and salaries paid to employees of the Contractor and subcontractors providing services to the County which may be accessed electronically at https://ulstercountyny.gov/purchasing/salaries-wages (a hard copy will be provided upon the Contractor's request); and

.2 Certification of wages in accordance with Article 23 (Ulster County Living Wage Act) which may be accessed electronically at https://ulstercountyny.gov/purchasing/living-wage-act (a hard copy will be provided upon the Contractor's request).

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

§ 5.1.3 Provided that an Application for Payment is received by the Owner, the Architect, and the Construction Manager not later than the twentieth (20th) day of a month, the Owner shall make payment of the certified amount in the Application for Payment to the Contractor not later than the thirty (30 days after the Owner's receipt of certification of the payment application . If an Application for Payment is received by the Owner, the Architect, and the Construction Manager after the application date fixed above, payment shall be made by the Owner not later than thirty (30) days after the Owner's receipt of the certification of the Payment Application .
(Federal, state or local laws may require payment within a certain period of time.)

§ 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 and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. 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.

All line items in the schedule of values and in each Application for Payment shall include corresponding subdivisions from the Construction Specifications institute ("CSI") codes a sample of which is listed in Schedule A of this Agreement.

§ 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 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of five percent (5%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute may be included as provided in Section 7.3.9 of the General Conditions;;

.2 Add 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), less retainage of five percent (5%); and

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

.4 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of the General Conditions.,

§ 5.1.4.4 The progress payment amount determined in accordance with Section 5.1.4.3 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficiently equal to two (2) times the item value of punchlist work remaining of the Contract Sum, plus such amounts as the Construction Manager recommends and the Architect determines for incomplete Work and unsettled claims; and

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of the General Conditions.

§ 5.1.4.5 Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.4.3.1 and 5.1.4.3.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

§ 5.2 Final Payment

§ 5.2.1 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 Section 12.2 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit A, Determination of the Cost of the Work when payment is on the basis of the Cost of the Work, with or without a Guaranteed Maximum payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than sixty (60) days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Section 15.3 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 Section 15.3 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution below, 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.

[« »] Arbitration pursuant to Section 15.4 of AIA Document A232–2009.

[« X »] Litigation in a court of competent jurisdiction.

[« »] Other: *(Specify)*

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.

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

.)

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 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.)

Zero (0 %)

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

Jacob Blosser»
«Ulster County Department of Public Works »
«317 Shamrock Lane »
«Kingston, New York 12401 »
«Phone 845-340-3140»
«e-mail jblo@co.ulster.ny.us

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

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten(10) days' prior notice to the other party.

§ 8.6 Other provisions:

.1 **CORPORATE COMPLIANCE**

The Contractor agrees to comply with all federal, state, and local laws, rules, and regulations governing the provision of goods and/or Services under this Agreement. In particular, the Contractor agrees to comply with the laws, rules and regulations of Ulster County, as well as with its Compliance Plan (the "Plan"). The Plan can be viewed at https://ulstercountyny.gov/ulster-county-compliance-plan. Alternatively, a hard copy of the Plan will be provided upon the Contractor's request. The Plan relates to the County's compliance with relevant federal and state fraud and abuse laws. The Contractor represents and warrants that it has read and understands the Plan and agrees to abide by its terms when delivering Services under this Agreement. The County may terminate this Agreement, in whole or in part, at any time for Contractor's failure to comply with the County's Compliance Plan. The Contractor shall ensure that each individual who provides such Services under this Agreement is provided with a copy of the Plan or given access to the Plan. The County strongly encourages all healthcare providers contracting with the County to implement their own compliance programs that address each of the elements of compliance recommended by the Office of the Inspector General, as well as the elements as recommended and/or mandated by the New York State Office of the Medicaid Inspector General.

The County will conduct appropriate screening of providers, independent contractors, vendors, and agents to ensure and verify that they have not been sanctioned and/or excluded by any federal or state law enforcement, regulatory, or licensing authority. The County will also verify that entities and businesses that provide and/or

perform Services for the County have not been the subject of adverse governmental actions and/or excluded from the federal healthcare programs.

TheContractor understands that the County has established and implemented a Corporate Compliance Program and has developed "Standards of Conduct for Ulster County Vendors and Contractors" (the "Standards"). The Standards can be accessed electronically at any time by going to https://ulstercountyny.gov/ulster-county-compliance-plan. Alternatively, a hard copy of the Standards will be provided upon the Contractor's request. The Contractor represents that it has read, understands and agrees to comply with the Standards with respect to its performance pursuant to this Agreement. The hotline for reporting violations of the Standards is (877) 569-8777

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement are comprised of the following documents:

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

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

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

.4 Drawings

Number	Title	Date

.5 Specifications

Section	Title	Date	Pages

.6 Addenda, if any:

Number	Date	Pages

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.

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

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

[ ] 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

.8 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 bidding requirements such as the advertisement or invitation to bid, Instructions to Bidders, sample forms, and the Contractor's bid, 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.)

ARTICLE 10 INSURANCE AND BONDS
The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A232–2009.
(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A232–2009.)

Type of Insurance or Bond	Limit of Liability or Bond Amount ($0.00)
AIA A310-2010 Bid Bond	Five Percent (5%) of attached bid.
AIA A312-2010 Performance and Payment Bond	Contract Price as Awarded

(Rev. 6-01-19)

PLEASE BRING THESE INSURANCE REQUIREMENTS TO YOUR INSURANCE AGENT TO ENSURE PROPER COVERAGE AND LIMITS ARE IN PLACE. FAILURE TO PROVIDE CERTIFICATE(S) OF INSURANCE EVIDENCING REQUIREMENTS BELOW, SHALL DELAY CONTRACT EXECUTION.

SCHEDULE C
COUNTY OF ULSTER CONTRACT INSURANCE REQUIREMENTS

I. CONDITIONS OF INSURANCE
Unless otherwise authorized by the Ulster County Insurance Officer, strict adherence to this schedule is required. Any deviation without prior authorization from the County's Insurance Department will result in a delay in the finalization of this Agreement.

The Contractor shall submit copies of any or all required insurance documents as and when requested by the County. Upon policy renewal, the Contractor shall submit updated insurance policy information.

II. CERTIFICATES OF INSURANCE
The Contractor shall file with the County's Insurance Department, prior to commencing work under this Agreement, all proper Certificates of Insurance.

The Certificates of Insurance shall include:

a. Name and address of Insured
b. Issue date of certificate
c. Insurance company name
d. Type of coverage in effect
e. Policy number
f. Inception and expiration dates of policies included on the certificate
g. Limits of liability for all policies included on the certificate
h. "Certificate Holder" for all certificates shall be the County of Ulster, P.O. Box 1800, Kingston, New York 12402-1800.

If the Contractor's insurance policies should be non-renewed or canceled, or should expire during the life of this Agreement, the County shall be provided with a new certificate indicating the replacement policy information as requested above. The County requires thirty (30) days prior written notice of cancellation [ten (10) days for non-payment of premium] from the Insurer, its agents or representatives.

The Contractor agrees to indemnify the County of Ulster for any applicable deductibles and self-insured retentions.

III. WORKERS' COMPENSATION AND DISABILITY INSURANCE

The Contractor shall take out and maintain during the life of this Agreement, Workers' Compensation (WC) Insurance and Disability Benefits (DB) Insurance, for all of its employees employed at the site of the project, and shall provide Certificates of Insurance evidencing this coverage to the County's Insurance Department.

If the Contractor is not required to carry such insurance, the Contractor must submit form CE-200 attesting to the fact that it is exempt from providing WC and/or DB Insurance coverage for all of its employees.

The manner of proof related to WC and DB Insurance is controlled by New York State Laws, Rules and Regulations. "ACORD" forms are not acceptable proof of WC and/or DB Insurance.

IV. WORKERS' COMPENSATION REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 57, a business entity (the Contractor) seeking to enter into a contract with a municipality (the County) must provide one of the following forms to the municipal entity with which it is entering into a contract including a Waiver of Subrogation Endorsement. The Contractor should contact their insurance agent to obtain acceptable proof of WC coverage:

- Form C-105.2 – "Certificate of NYS Workers' Compensation Insurance" **or**
- Form U-26.3 – "Certificate of Workers' Compensation Insurance" issued by the New York State Insurance Fund **or**
- Form SI-12 – "Affidavit Certifying that Compensation has Been Secured" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured **or**
- Form GSI-105.2 – "Certificate of Participation in Workers' Compensation Group Self-Insurance" issued by the Self-Insurance administrator of the group **or**
- Form GSI-12 – "Certificate of Group Workers' Compensation Group Self-Insurance" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured.

If the Contractor is not required to carry WC coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at http://www.wcb.ny.gov

V. DISABILITY BENEFITS REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 220(8), a business entity (the Contractor) seeking to enter into a contract with a municipality (the County) must provide one of the following forms to the municipal entity it is entering into a contract with. The Contractor should contact their insurance agent to obtain acceptable proof of DB Insurance Coverage:

- Form DB-120.1 – "Certificate of Insurance Coverage Under the NYS Disability Benefits Law" **or**
- Form DB-155 – "Compliance with Disability Benefits Law" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured.

If the Contractor is not required to carry DB Insurance coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at http://www.wcb.ny.gov

VI. COMMERCIAL GENERAL LIABILITY INSURANCE

The Contractor shall take out and maintain during the life of this Agreement, such bodily injury liability and property

damage liability insurance as shall protect it and the County from claims for damages for bodily injury including accidental death, as well as from claims for property damage that may arise from operations under this Agreement, whether such operations be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either of them.

It shall be the responsibility of the Contractor to maintain such insurance in amounts sufficient to fully protect itself and the County, but in no instance shall amounts be less than the minimum acceptable levels of coverage set forth below:

- Bodily Injury and Property Damage Liability Insurance in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** for each occurrence, and in an amount not less than **FOUR MILLION AND 00/100 ($4,000,000.00) DOLLARS** general aggregate.

Other Conditions of Commercial General Liability Insurance:

a. Coverage shall be written on Commercial General Liability form.
b. Coverage shall include:
    1. Contractual Liability
    2. Independent Contractors
    3. Products and Completed Operations
    4. Pollution Liability when required
    5. Owners and Contractors Protective Liability
c. "Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York, 12402-1800", shown on the Commercial General Liability policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

VII. UMBRELLA LIABILITY OR EXCESS LIABILITY INSURANCE

Umbrella Liability or Excess Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS**.

NOTE: As long as all minimum underlying limits have been met, insurance limits may be a total combined limit of the Umbrella/Excess Liability limits and the underlying liability insurance limits.

The Umbrella/Excess Liability coverage MUST be written on a follow-form (drop down) basis to the underlying insurance coverage with no additional exclusions.

"Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York, 12402-1800", shown on the Umbrella policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

VIII. AUTOMOBILE LIABILITY INSURANCE

Automobile Bodily Injury Liability and Property Damage Liability Insurance shall be provided by the Cntractor, with a minimum Combined Single Limit (CSL) of **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS.**

Coverage shall include:

a. All owned vehicles
b. Any hired automobile
c. Any non-owned automobile
d. "Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York, 12402-1800", shown on the Auto Liability policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

IX. POLLUTION LIABILITY INSURANCE

[X] If this box is checked, Pollution Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000) DOLLARS** for each occurrence and in an amount of not less than **FIVE MILLION AND 00/100 ($5,000,000) DOLLARS** general aggregate.

X. PROFESSIONAL LIABILITY INSURANCE (e.g. MALPRACTICE, MEDIA LIABILITY, ERRORS & OMISSIONS INSURANCE)

[ ] If this box is checked, Professional Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS** for each occurrence and in an amount of not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS** general aggregate.

XI. RIGGERS LIABILITY INSURANCE

[X] If this box is checked, Riggers Liability Insurance shall be provided by the Contractor in an amount not less than **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS** for each occurrence and in an amount of not less than **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS** general aggregate.

XII XCU (Explosion, Collapse, and Underground) Endorsement/Commercial General Liability Coverage:

[ ] If this box is checked, an Explosion, Collapse, and Underground Endorsement shall be provided by the Contractor in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** for each occurrence, and in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** general aggregate.

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)*

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

SECTION 00 65 19.13 – AFFIDAVIT OF PAYMENT OF DEBTS & CLAIMS

AIA® Document G706® – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

TO OWNER: *(Name and address)*

CONTRACT DATED:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☐
OTHER ☐

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707™, Consent of Surety to Final Payment, may be used for this purpose.
   Indicate attachment: ☐ Yes ☐ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof
3. Contractor's Affidavit of Release of Liens (AIA Document G706A™)

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 65 19.16 – AFFIDAVIT OF RELEASE OF LIENS FORM

AIA® Document G706®A – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

TO OWNER: *(Name and address)*

CONTRACT DATED:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☐
OTHER ☐

STATE OF:

COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 65 19.17 – CONSENT OF SURETY TO FINAL PAYLMENT

AIA® Document G707™ – 1994

Consent of Surety to Final Payment

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

CONTRACT DATED:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☐
OTHER ☐

TO OWNER: *(Name and address)*

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

Attest:
(Seal)

(Printed name and title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 72 16 – GENERAL AND SUPPLEMENTARY CONDITONS

AIA® Document A232® – 2019

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

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

Ulster County Government Operations Center RFB-UC__-XXXXC
Paradies Lane
New Paltz, New York 1256

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

The Palombo Group
22 Noxon Road
Poughkeepsie, New York 12601

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

County of Ulster
244 Fair Street
P.O. Box 1800
Kingston, New York 12401

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

Urbahn Architects PLLC
306 West 37th Street, 9th Floor
New York New York 10018

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.

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.

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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 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 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 Multiple Prime Contractors, and by the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 1.1.5 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.

§ 1.1.6 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.

§ 1.1.7 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.

§ 1.1.8 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, and certify termination of the Agreement under Section 14.2.2.

1.1.9 Approved When the words "approved," "satisfactory," "proper," or "as directed" are used, approval by the Architect shall be understood.

1.1.10 Provide When the word "provide," including derivatives, is used, it shall mean to fabricate properly, complete transport, deliver, install, erect, construct, test, and furnish all labor, materials, equipment, apparatus, appurtenances, and all other items necessary to properly complete in place, ready for operations or use under the terms of the Specifications.

1.1.11 Addenda Addenda are written or graphic instruments issued prior to the execution of the Contract that modify or interpret the bidding documents, including the Drawings and Specifications, by additions, deletions, clarifications, or corrections.

1.1.12 Bulletins Bulletins are written or graphic instruments issued by the Architect after the execution of the Contract that request a proposal from the Contractor that, if accepted by the Owner, will cause the execution of a Change Order to modify the Contract Documents.

1.1.13 Knowledge The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill, and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor exercising the care, skill, and diligence required of the Contractor by the Contract Documents.

1.1.14 Project Manual The Project Manual is a volume assembled for the work that includes the Instructions to Bidders, Supplementary Instructions to Bidders, General Conditions, Supplementary General Conditions, the Specifications, and all Addenda issued prior to execution of the Contract. When required by the Agreement, the Project Manual will additionally include bidding requirements and documents and sample forms

§ 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 and reasonably inferable from them as being necessary to produce the indicated results.

.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations shall be based on the following priorities:

a) The Agreement
b) Addenda, with those of later date having precedence of those of earlier date.
c) The Supplementary Conditions
d) The General Conditions of the Contract for Construction.
e) Division 1 of the Specifications.
f) Drawings and other Divisions 2-34 the Specifications.
g) In the case of conflicts or discrepancies between Drawings and Divisions 2-34 the Specifications or within either Document not clarified by addendum, the higher quality and/or greater quantity shall govern.

.2 On the Drawings, given dimensions shall take precedence over scaled measurements and large-scale Drawings over small-scale Drawings.

.3 Before ordering any materials or doing any work, the Contractor and each Subcontractor shall verify measurements at the Project Site and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the Work.

.4 If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change

§ 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.

Instructions and other information furnished in the Specifications, including, without limitation, items in connection with prefabricated or pre-finished items, are not intended to supersede work agreements between employers and employees. Should the Specifications conflict with such work agreements, the work agreements shall be followed, provided such items are provided and finished as specified. If necessary, such Work shall be performed on the Project site, instead of at the shop, by appropriate labor and in accordance with the requirements of the Drawings and Specifications.

§ 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 The reference of the "Specifications" regarding the division or separation of the work among types of trades or occupations is only for the suggested purpose of coordinating the work of the different trades, etc. but it shall be the Contractor's entire responsibility for the proper coordination and completion of all the work described in the "Specifications" whether performed by the Contractor or Subcontractors, if any.

§ 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 The Owner shall be deemed the sole author and owner of the Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory, and other reserved rights, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and material or equipment 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 this Project is not to be construed as publication in derogation of the Owner's reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them, 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Transmission of Data in Digital Form
§ 1.6.1 The Architect may, at the Architect's sole discretion, furnish electronic versions of some of the Instruments of Service to the Contractor. The Contractor shall comply with any conditions set by the Architect for the use of these electronic documents, including compensation to the Architect or the Architect's consultants. The Contract Documents shall take precedence over any electronic versions of the Instruments of Service that are furnished to the Contractor. The Contractor shall be responsible for identifying and correlating any discrepancies between the Contract Documents, approved submittals, changes in the Work, field conditions and any electronic versions of the Instruments of Service.

§ 1.6.2 The Contractor shall not transfer or reuse electronic versions of the Instruments of Service in electronic or machine readable form without the prior written consent of the Architect and the Owner.

§ 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 Confidentiality
§ 1.8.1 For purposes of this section:

A. The term "Confidential Information" as used herein, means all material and information, whether written or oral, received by the Contractor from or through the Owner or any other person connected with the Owner, or developed, produced, or obtained by the Contractor in connection with its performance of Services under this Agreement. Confidential Information will include, but not be limited to: samples, substances and other materials, conversations, correspondence, records, notes, reports, plans, drawings, specifications and other documents in draft or final form, including any documentation or data relating to the results of any investigation, testing, sampling in laboratory or other analysis, and all conclusions, interpretations, recommendations, and/or comments relating thereto.

B. The term "Contractor" as used in this section includes all officers, directors, employees, agents, subcontractors, assignees, or representatives of the Contractor.

The Contractor shall keep all Confidential Information in a secure location within the Contractor's offices. The Owner will have the right, but not the obligation, to enter the Contractor's offices in order to inspect the arrangements of the Contractor for keeping Confidential Information secure. The Owner's inspection, or its failure to inspect, will not relieve the Contractor of its responsibilities pursuant to this section.

The Contractor shall hold Confidential Information in trust and confidence, and must not disclose Confidential Information, or any portion thereof, to anyone other than the Owner without the prior written consent of the Executive or the Purchasing Director, and must not use Confidential Information, or any portion thereof, for any purpose whatsoever except in connection with its performance of the Services under this Agreement.

The Contractor shall notify the Owner immediately upon its receipt of any request by anyone other than the Owner for, or any inquiry related to, Confidential Information. The Contractor is not prohibited from disclosing portions of Confidential Information if and to the extent that: (i) such portions have become generally available to the public other than by an act or omission of the Contractor, or (ii) disclosure of such portions is required by subpoena, warrant, or court order; provided, however, that in the event anyone other than the Owner requests all or a portion of Confidential Information, the Contractor shall oppose such request and cooperate with the Owner in obtaining a protective order or other appropriate remedy, unless and until the Executive or the Purchasing Director, upon consultation with the Ulster County Attorney, in writing, waives compliance with the provisions of this section, or determines that disclosure is legally required. In the event that such protective order or other remedy is not obtained, or the Owner waives compliance with this section, or determines that such disclosure is legally required, the Contractor shall disclose only such portions of Confidential Information that, in the opinion of the Owner, the Contractor is legally required to disclose, and the Contractor shall use its best efforts to obtain from the party to whom Confidential Information is disclosed, written assurance that confidential treatment will be given to any such Confidential Information disclosed, to the extent permitted by law.

Prior to the performance of any of the Services in connection with this Agreement, the Contractor shall obtain from each of its subcontractors, a confidentiality agreement running to the benefit of the Owner that is substantively identical to this section. Further, at any time, if requested by the Owner, the Contractor shall obtain such an agreement from the officers, directors, agents, representatives, or employees of the Contractor and/or any of its subcontractors.

§ 1.8.2 Notwithstanding any other provision herein to the contrary:

A. All Confidential Information, as defined in section § 1.8.1, including all copies thereof, is the exclusive property of the Owner regardless of whether or not it is delivered to the Owner. The Contractor shall deliver Confidential Information and all copies thereof to the Owner upon request.

B. To the extent that copies of Confidential Information are authorized by the Owner to be retained by the Contractor, such information shall be retained in a secure location in the Contractor's office for a period of six (6) years after completion of the Services, or termination of this Agreement, whichever occurs later, and thereafter disposed of at the Owner's direction

§ 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 Article 4 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 Information and Service Required of the Owner

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if .(1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2..2.2 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, through the Construction Manager, shall secure and pay for the building permit.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2..2.4 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..2.5 The Contractor shall be furnished, free of charge, electronic versions of the Contract Documents, including Drawings, Project Manuals, and Addenda, which the Contractor may use for printing purposes as needed for the execution of the work. .

§ 2..2.6 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall provide, within a reasonable time thereafter, the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 2.2.7 The Owner shall procure and bear costs of Special Inspections and any other testing or inspections indicated by the Contract Documents as the Owner's responsibility. The Owner shall not be responsible for the costs of any testing or inspections indicated by the Contract Documents as the Contractor's responsibility. All additional costs incurred by Owner for retesting of failed products, systems or installed Work shall be paid by contractor causing defects

§ 2.3 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 repeatedly fails to carry out Work in accordance with the Contract Documents,as determined by the Construction Manager, Architect, or the Owner, the Owner may issue a written order to 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.

§ 2.4 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 seven (7)day period after receipt of written notice from the Construction Manager, Architect, or 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.5 Extent of Owner Rights

2.5.1 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner or Construction Manager (i) granted in the Contract Documents, (ii) at law, or (iii) in equity.

2.5.2 In no event shall the Owner or Construction Manager have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner or the Construction Manager in the Contract Documents.

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.

In performing the Work and incurring expenses under this Contract, the Contractor shall operate as, and have the status of, an independent contractor and shall not act as agent, or be an agent of the Owner. As an independent contractor, the Contractor shall be solely responsible for determining the means and methods of performing the Work and shall have complete charge and responsibility for the Contractor's personnel engaged in the performance of the same.

In accordance with such status as independent contractor, the Contractor covenants and agrees that neither it, nor its employees or agents, will hold themselves out as, nor claim to be officers or employees of the Owner, or of any department, agency or unit thereof by reason hereof, and that they will not by reason hereof make any claim, demand or application to or for any right or privilege applicable to an officer or employee of the Owner including, but not limited to Workers' Compensation coverage, health coverage, Unemployment Insurance benefits, Social Security coverage or employee retirement membership or credit.

§ 3.1.2 The plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 3.1.3 The Contractor shall perform the Work in accordance with the Contract Documents. The Contractor specifically represents and covenants that it, its officers, employees, agents, servants consultants and sub-contractors have and shall possess the necessary and required licenses, experience, knowledge and character to qualify the Contractor and/or officers, employees, agents, servants consultants and sub-contractors for the particular duties they perform.

> **§ 3.1.3.1** Work performed by all Sub-Contractors of the General Construction Contractor shall be limited to 75% aggregate of the Prime Contract.
>
> **§ 3.1.3.2** Work performed by all Sub-Contractors of other trade Contractors shall be limited to 50% aggregate of the Prime Contract.

§ 3.1.4 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.

§ 3.1.5 The Contractor shall not assign any of its rights, interests or obligations for the Work without the prior express written consent of the Owner and the Architect. Any assignment, transfer, conveyance or other disposition without such prior consent shall be void and any Work provided thereunder will not be compensated. Any subcontract or assignment properly consented to by the Owner or Architect shall be subject to all of the terms and conditions of this Contract. Any

assignment of this Agreement shall not relieve the assignor of its obligations hereunder. All provisions shall be binding upon and inure to the benefit of the respective successors and assignees to the same extent as if each such successor or assignee were named as a party to this Agreement.

Failure of the Contractor to obtain any required consent to any assignment, shall be grounds for termination for cause at the option of the Owner, and if this Contract be so terminated, the Owner shall thereupon be relieved and discharged from any further liability and obligation to the Contractor, its assignees, or transferees; and all monies that may become due shall be forfeited to the Owner, except so much thereof as may be necessary to pay the Contractor's employees for past Work.

.1 Sale of stock constituting controlling interest of Contractor's company shall be deemed to be an assignment for purposes of this Agreement.

§ 3.1.6 The prior written approval of the Owner is required before the Contractor, or any of its employees, representatives, servants, agents, assignees or subcontractors may, at any time, either during or after completion or termination of this Contract, make any statement to the media or issue any material for publication bearing on the Work performed or data collected in connection with this Contract.

If the Contractor, or any of its employees, representatives, servants, agents, assignees or subcontractors desires to publish a work dealing with any aspect under this Contract, or of the results or accomplishments attained in such performance, they must first obtain the prior written permission of the Owner which, unless otherwise agreed to in said written permission, will entitle the Owner to have a royalty fee and a non-exclusive and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use such publication.

§3.1.7 Owner may assign this Agreement to any subsequent owner of the Project, a construction lender, or any subsequent Architect or other person or entity fulfilling all or substantially all of the obligations of Owner.

§3.1.8 Contractor agrees to perform all of its obligations hereunder for any subsequent owner of the Project, any mortgagee in possession, construction lender, surety or other person designated by any such mortgage in possession, construction lender, surety or any of their assigns to complete the Project.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

Prior to execution of the Agreement, the Contractor and each Subcontractor have evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1.

§ 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 2.2.3, 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 design information contained 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. The Contractor shall be held responsible for any cost or delay resulting from the Contractor's failure to obtain or heed the Architect's clarifications or instructions concerning any discovered error, discovered omission, discovered discrepancy or discovered inconsistency

§ 3.2.2 1. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Construction Manager, Architect, or the Owner.

§ 3.2.2 2. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 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 make 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.

§ 3.2.5 The Owner shall be entitled to deduct from the Contract Sum any additional amounts paid to the Architect to evaluate and respond to the Contractor's requests for information where such information was readily available to the Contractor from a study and comparison of the Contract Documents, field conditions, or prior Project correspondence or documentation.

§ 3.2.6 Except as to any reported errors, inconsistencies or omissions, and except as to concealed or unknown conditions, by executing the Agreement, the Contractor represents the following to the Owner, Owner's Authorized Representative, Agent or the Architect:

.1 The Contract Documents are sufficiently complete and detailed for the contractor to perform the Work required and to comply with all the requirements of the Contract Documents.

.2 The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedure and techniques necessary to perform the Work, use of materials, selection of equipment and requirements of product manufacturers are consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to Work; (3) the requirements of any warranties applicable to the Work; and (4) all laws, ordinances, regulations, rules and orders which bear upon the Contractor's performance of the Work.

§ 3.2.7 If the Contractor, during the progress of the work, discovers any discrepancies between the Drawings and the Specifications, errors and/or omissions on the Drawings, or any discrepancies between physical condition of the work and the Drawings, he shall immediately notify the Architect in writing who shall promptly adjust same. Whether or not an error is believed to exist, deviations from the Drawings and dimensions given thereon shall be made only after approval in writing is obtained from the Architect. Any work performed after such discovery without the approval of the Architect shall be at the Contractor's risk and expense.

§ 3.2.8 Whenever the Drawings show existing or other construction not required as part of the Contract Work, it is understood that it is so shown as a matter of information and that the Owner, while believing such information to be substantially correct, assumes no responsibility thereof. The Contractor shall become familiar with all conditions affecting the nature and manner of conducting the work

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. 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, except as stated below, shall be fully and 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 written notice to the Owner, the Construction Manager, and the Architect, and shall not proceed with that portion of the Work without further written instruction from the Owner and Architect through the Construction Manager.

§ 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.

§ 3.3.4 Where equipment lines of piping and/or conduit are shown diagrammatically, the Contractor shall be responsible for the coordination and orderly arrangement of the various lines of exposed piping and conduit included in the Work of his/her Contract. The Contractor shall coordinate the work of several Subcontractors and prevent all interferences between equipment, lines of piping, architectural features, and avoid any unsightly arrangements in the exposed 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 authorized by the Architect in accordance with Sections 3.12.8 or 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. By making requests for substitution, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined it is equal or superior in all respects to the specified;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data represented is complete and includes all related costs under this Contract except the Architects redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent;

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects; and

.5 the Contractor understands the Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions. This amount will be determined by the Architect when submission is made and before any additional work is performed by the Architect in regards to the substitution to allow the Contractor the option of going forward with said proposal consideration or not.

.6 If a substitution effects the work of another trade contractor, the potential costs thereof shall be borne by the contractor requesting the substitution.

§ 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 All material placed on the Project site by Contractor and not paid for by Owner prior to its incorporation into the Project shall be owned by Contractor. Materials placed on the site and not yet incorporated into the project by the Contractor which is paid for by Owner, shall be subject to the requirements in section 3.13.3.

§ 3.4.5 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance.

.1 If the Work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner and without recourse to the Architect, the Construction Manager or the Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the work of any particular trade.

.2 In case the progress of the Work is affected by any undue delay in furnishing or installing any items or materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

§ 3.4.6 Apprentice Program

For the purposes of this project, the County of Ulster requires that all contractors and subcontractors with contracts in excess of THREE HUNDRED THOUSAND AND 00/100 ($300,000.00) DOLLARS have trade specific Apprenticeship Agreements appropriate for the type and scope of work to be performed by each trade that is being utilized. These Apprenticeship Agreements must have been registered with, and adopted by, the New York State Commissioner of Labor, in accordance with Article 23 of the Labor Law. Satisfactory evidence of registration with the New York State Commissioner of Labor will be requested by the County prior to award of the contract.

§ 3.5 Warranty

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 with 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 shall 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.

The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

If necessary as a matter of law, the Contractor may retain the right to enforce directly any such manufacturers' warranties during the one-year period following the date of Substantial Completion, referred to in Section 12.2.2

§ 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.

§ 3.6.1 The Owner is exempt from payment of sales and compensation use taxes of the State of New York and of cities, counties and other subdivisions of the State, for materials sold to it pursuant to the provisions of this contract.

§ 3.6.2 Contractor's purchase of tangible personal property which do not become an integral component part of the exempt organizations real property, and are consumed by the Contractor as well as purchases of taxable services, are subject to tax. The Contractor shall pay those taxes.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1. Except as set forth in Section 2.2.2, the Contractor shall secure, pay for, and as soon as practicable, furnish the Owner with copies or certificates of all permits, and fees, licenses, and inspections necessary for the proper execution and completion of the Work. All connection charges, assessment, or inspection fees as may be imposed by any municipal agency or utility company are included in the Contract Sum and shall be the Contractor's responsibility. .

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders and all other requirements of public authorities applicable to performance of the Work.

The Contractor shall procure and obtain all bonds required of the Owner or the Contractor by the municipality in which the Project is located or any other public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary backup material, and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closings, parking meter removal, and other similar matters as may be necessary or appropriate from time to time for the 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 or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist 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 five (5) business 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 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 an equitable adjustment 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 from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, in writing, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may proceed 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** 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.
§ 3.8.4 The Contractor shall include installation costs in the allowance and exclude them from the allowance as and where required by the Contract Documents. In absence of any clarification in the Contract Documents in regards to installation costs, Contractor shall include the installation costs in the allowance amounts.

§ 3.9 Superintendent

§ 3.9.1 Prior to starting the work, the Contractor shall designate the Project Manager, Superintendent and other key individuals who shall be assigned to the Project through and including final completion. Such designations shall be in writing and provided to the Construction Manager, the Architect, and the Owner. The Superintendent shall be in attendance at the Project site throughout the work, remain on the Project site not less than eight hours per day, five days per week, until termination of the Contract, unless the job is suspended, work is stopped by the Owner, or no work is scheduled. The Superintendent shall be approved by the Owner in its sole discretion. Said representatives shall be qualified in the type of work to be undertaken and shall not be changed during the course of construction without the prior written consent of the Owner. Should a representative leave the Contractor's employ, the Contractor shall promptly designate a new representative. The Owner shall have the right, at any time, to direct a change in the Contractor's representatives if their performance is unsatisfactory. In the event of such a demand, the Contractor shall within seven days after notification thereof, replace said individual(s) with an individual(s) satisfactory to Owner, in Owner's sole discretion. If said replacement is disapproved, the Contractor may, at Owner's option, be terminated for cause. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Owner shall have no obligation to direct or monitor the Contractor's employees. All references herein to the Superintendent shall be taken to mean the Contractor's superintending staff. Each Subcontractor shall designate the Project Manager, Superintendent and other key individuals who shall be assigned to the Project

§ 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information, and the Owner and Construction Manager's approval a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project schedule to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.. . 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 Multiple Prime Contractors, or the construction or operations of the Owner's own forces.

§ 3.10.2 The Contractor, shall prepare a submittal schedule promptly after being awarded the Contract and thereafter update it as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Construction Manager's, Architect's, and Owner's approval. The Architect's, Construction Manager's, and Owner's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager, Architect and Owner reasonable time to review submittals. If the Contractor fails to submit a 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 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. The Contractor shall coordinate its schedule with the Construction Manager, the Owner's operations and with the schedule of other contractors employed by the Owner. The Contractor shall modify its schedule as required to incorporate the activities of the Owner, the schedules of other contractors and the requirements of the Contract Documents. The Contractor shall cooperate with the Owner and the Owner's representatives to coordinate schedules and to complete the Project in a timely manner.

§ 3.10.5 Upon review and acceptance by the Owner, Architect and Construction Manager of the Contractor's construction schedule, the construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as an Exhibit. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner, the Architect, and the Construction Manager, and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the Project schedule and shall promptly advise the Owner of any delays or potential delays. The accepted Project schedule shall be updated to reflect actual conditions (sometimes referred to in these Supplementary Conditions as "progress reports") as set forth in Section 3.10.1 or if requested by either the Owner or the Architect. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

3.10.6 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

.1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Section 3.10.6.

.2 The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.6 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

3.10.7 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Section 3.10.7 may be grounds for an extension of the Contract Time, if permitted under Section 8.3.1, and an equitable adjustment in the Contract Sum if (i) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, and (ii) such rescheduling or postponement is required for the convenience of the Owner

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain, at the site for the Owner one (1) copy of the Drawings, Specifications, Addenda, , Change Orders,, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples, and similar required submittals. These documents shall be available to the Architect, 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.

§ 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 the way by which 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 4.2.9 through 4.2.11. 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 Multiple Prime 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 Multiple Prime 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically informed the Construction Manager and Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional, and who shall comply with reasonable requirements of the Owner regarding qualifications and insurance. 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 and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications, and approvals performed or provided by such design professionals. Pursuant to this Section 3.12.10, the Architect will review 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 contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and two (2) re-submittals. The Architect's review of additional submittals will be made only with the consent of the Owner after

notification by the Architect. The Owner shall be entitled to deduct from the Contract sum amounts paid to the Architect for evaluation of such additional re-submittals.

§ 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, and 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 Only materials and equipment that 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 promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

3.13.4 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

3.13.5 Without limitation of any other provision of the Contract Documents, the Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas and buildings adjacent to the site of the Work and (ii) the Building in the event of partial occupancy, as more specifically described in Section 9.9. Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

.1 Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance of any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the rules and regulations.

.2 The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building

§ 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, and patching shall be restored to the condition existing prior to the cutting, fitting, and 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's own forces, , or of other Multiple Prime Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner's own forces, or by other Multiple Prime Contractors except with written consent of the Construction Manager, Owner, and such other Multiple Prime Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the, other Multiple Prime Contractors, or the Owner, the Contractor's 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 or 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. Such reimbursement shall be deducted from the Contract Sum. In the event there are no monies owed by the Owner to the Contractor, the Contractor will reimburse Owner immediately upon receipt of an invoice.

§ 3.15.3 The Contractor shall dispose of all waste material, rubbish and debris properly and legally and shall be responsible for any costs and liability associated with such disposal.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect 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 such 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 the Contractor has reason to believe that the required design process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 The Contractor agrees to defend, indemnify and hold harmless the Owner, Construction Manager, Architect, and/or Construction Manager's and Architect's consultants, including each of their officials, employees and agents against all claims, liens, demands, losses, damages, liabilities, causes of action, costs or expenses (including without limitation, reasonable attorney fees and costs of litigation and/or settlement), whether incurred as a result of a claim by a third party or any other person or entity, arising out of the Work performed by the Contractor, its employees, representatives, subcontractors , assignees, or agents, pursuant to this Contract which the Owner, Construction Manager, Architect, and/or Construction Manager's and Architect's consultants or each of their officials, employees, or agents, may suffer by reason of any negligence, fault, act or omission of Contractor, its employees, representatives, subcontractors, assignees, or agents. . The Contractor agrees to investigate, handle, respond to, provide defense for, and defend any such claims, demands or suits at its sole expense and agrees to bear all other costs and expenses related thereto, even if such claims, demands or suits are groundless, false or fraudulent. Contractor further agrees to investigate, handle, respond to, provide defense for and defend any claims, demands or lawsuit(s) at its sole expense and agrees to bear all other costs and expenses related thereto. The foregoing provisions shall not be construed to indemnify the Owner, Construction Manager and Architect for damage arising out of bodily injury to persons or to property caused by or resulting from the sole negligence of the Owner's, Construction Managers, and Architect's employees. This indemnification section shall survive the expiration or termination of this Agreement.

In the event that any claim is made or any action is brought against the Owner, Construction Manager, Architect, and/or Construction Manager's and Architect's consultants arising out of the negligence, fault, act or omission of an employee, representative, subcontractor, assignee or agent of the Contractor, either within or without the scope of the respective employment, representation, subcontract, assignment or agency, or arising out of the Contractor's negligence, fault, act or omission, then the Owner shall have the right to withhold further payments hereunder for the purpose of set-off in sufficient sums to cover the said claim or action. The rights and remedies of the Owner, Construction Manager, Architect, and/or Construction Manager's and Architect's consultants provided for in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law, in equity, or pursuant to the Contract and do not 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.

In the event of a claim or dispute arising under the Contract Documents, the Contractor shall be liable to the Owner for reasonable attorneys' fees, costs, expenses and disbursements incurred by the Owner in enforcing its legal and/or equitable rights pursuant to the Contract Documents by reason of the failure of the Contractor to comply with any of the terms, conditions or warranties of this Agreement, express or implied, and/or the exercise of Owner's remedies with

respect thereto, and/or any error, omission and/or professional negligence of the Contractor or its sub-consultants, including but not limited to all attorney's fees, costs, expenses and disbursements incurred by the Owner in: prosecuting a lawsuit against the Contractor; seeking indemnification; obtaining correction of deficiencies; termination; and/or, set-off rights. The Contractor shall further be liable to the Owner for all prejudgment interest on any award of attorneys' fees, costs, expenses and disbursements so awarded. This provision shall survive completion of the work and/or expiration or termination pursuant to the Contract Documents.

§ 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 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.

§ 3.18.3 The Contractor shall require similar clauses in every contract between the Contractor and every subcontractor to the effect that every subcontractor, as a part of his/her subcontract, shall likewise be required to indemnify and hold harmless the Owner, Construction Manager, Architect, and Construction Manager's and Architect's consultants, and agents and employees of any of them against and from all suits, claims and actions of every name and description brought against the Owner, Construction Manager, and/or the Architect.

§ 3.18.4 The Contractor shall reimburse the Owner for any additional Architect and Construction Manager fees and expenses necessitated by the Contractor's performance or failure of performance.

§ 3.19 Existing Features and Underground Data – to be utilized in the future as needed.

§ 3.20.1 The location of existing features shown on plans is intended for general information only. The Contractor is responsible for making an accurate determination of the location of all structures which are reasonably observable, and shall not be entitled to any extra payment due to difficulties or distances encountered in the Work which would have been foreseeable thereby.

§ 3.20.2 The locations, depths and data as to underground conditions have been obtained from records, surface indications and data furnished by others, information furnished is solely for the convenience of the Contractor without any warranty, expressed or implied as to its accuracy or completeness.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 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. Any reference in the Contract Documents to the Architect's taking action or rendering a decision within a "reasonable time" is understood to mean no more than two (2) weeks.

In performing the Work and incurring expenses under this Contract, the Architect shall operate as, and have the status of, an independent contractor and shall not act as agent, or be an agent of the Owner. As an independent contractor, the Architect shall be solely responsible for determining the means and methods of providing Architectural and Engineering services and shall have complete charge and responsibility for the Architect's personnel engaged in the performance of the same.

In accordance with such status as independent contractor, the Architect covenants and agrees that neither it, nor its employees or agents, will hold themselves out as, nor claim to be officers or employees of the Owner, or of any department, agency or unit thereof by reason hereof, and that they will not by reason hereof make any claim, demand or application to or for any right or privilege applicable to an officer or employee of the Owner including, but not limited to Workers' Compensation coverage, health coverage, Unemployment Insurance benefits, Social Security coverage or employee retirement membership or credit.

§ 4.1.2 The Owner shall retain a construction manager lawfully licensed to practice construction management or an entity lawfully practicing construction management in the jurisdiction where the Project is located, to the extent the

applicable jurisdiction requires licensing for construction management services. 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.

§ 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, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.1.4 If the employment of the Construction Manager or Architect is terminated, the Owner shall employ a successor construction manager or architect as 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.

§ 4.1.5 The Architect agrees to retain all books, records and other documents relevant to this Contract for six (6) years after the final payment or termination of this Contract, whichever later occurs. The Owner, any State and/or Federal auditors, and any other persons duly authorized by the Owner, shall have full access and the right to examine any of said materials during said period.

§ 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 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, as the Work progresses and 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 reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner and Construction Manager (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

1 The Contractor shall reimburse the Owner for any additional Architect and Construction Manager fees and expenses necessitated by the Contractor's performance or failure of performance.

§ 4.2.3 The Construction Manager shall provide a staffing plan to include one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will inspect the Work to determine if the same is being performed in accordance with the Contract Documents, will keep the Owner reasonably informed of the progress of the Work, and will report to the Owner and Architect (1)known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Multiple Prime 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, or charge of, 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, except as provided in Section 3.3.1, 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 Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Construction Manager and shall within three (3) days thereafter provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. Communications

by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Multiple Prime Contractors shall be through the Construction Manager and shall within three (3) days thereafter be provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner's own forces, shall be through the Owner or shall be communicated within three (3) days thereafter to the Architect and the Architect's consultants.

§ 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. The Construction Manager shall determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, upon written authorization of the Owner, whether or not such 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, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 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 Multiple Prime Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from Contractor and other Multiple Prime 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.

§ 4.2.10 The Architect shall receive and review for conformance with the submittal requirements of the Contract Documents all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. The Architect shall independently review, evaluate, and approve or reject all Shop Drawings, Product Data, Samples, and similar submittals and make its recommendations to the Owner and the Construction Manager within seven (7) calendar days of receipt, by the Architect of such Shop Drawings, Product Data, Samples, and similar submittals. The Architect shall be independently responsible for its evaluation and approval or rejection of all Shop Drawings, Product Data, Samples, and similar submittals. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.11 Review of the Contractor's submittals by the Architect is 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 Architect will interpret and decide matters concerning the Contractor's performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Construction Manager's and Architect's review of the Contractor's submittals shall not relieve the Contractor of its 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, , unless otherwise specifically stated by the Construction Manager and Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall indicate approval of an assembly of which the item is a component.

§ 4.2.12 The Construction Manager, with the written approval of the Architect in accordance with Article 7 will prepare Change Orders and Construction Change Directives.

§ 4.2.13 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.

§ 4.2.14 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.

§ 4.2.15 The Construction Manager will be jointly responsible with the Architect for conducting inspections to determine the dates of Substantial Completion and the date of final completion; jointly 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.

§ 4.2.16 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.17 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.

§ 4.2.18 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.

§ 4.2.19 The Architect's decisions on matters relating to aesthetic effect in connection with administration of the Contract will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.20 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, to 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 Multiple Prime Contractors or subcontractors of other Multiple Prime 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager, for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion. of the Work, the Construction Manager may reply within fourteen (14) days to the Contractor in writing stating (1) whether the Owner, the Construction

Manager or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction manager, Architect, or Owner requires additional time for review. Failure of the Construction Manager, Owner, or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

.1 Refer to the "Information to Bidders" for requirements for delivery of Contractor's list of subcontractors to the Architect after receipt of bids and prior to the award of Contract.

.2 Subcontractors will not be acceptable unless, when requested by the Architect or the Owner, evidence is furnished that the proposed subcontractor has satisfactorily completed similar subcontracts as contemplated under this prime contract, and has the necessary experience, personnel, equipment, plant and financial ability to complete the subcontract in accordance with the intent of the Contract Documents.

§ 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. No increase to the Contract Sum shall be allowed if the Owner and Architect both have reasonable objections to a proposed subcontractor.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

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 responsibility for safety of the Subcontractor's Work, which the Contractor, by these 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.

§ 5.4 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 in writing; 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 such 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.

§ 5.4.4 The Contractor shall provide copies of written Subcontractor agreements to the Owner when requested.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY OTHER 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, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other contracts in connection with other portions of the Project or other construction or operations on the site and Conditions of the Contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If the Contractor claims that a delay is involved because of such action by the Owner, the Contractor may make a Claim for an extension of time as provided in Article 15.1.5

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.1.4 The Contractor accepts assignment of, and liability for, all purchase orders and other agreements for procurement of materials and equipment that are identified as part of the Contract Documents. The Contractor shall be responsible for such pre-purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. All warranty and correction of the Work obligations under the Contract Documents shall also apply to any pre-purchased items, unless the Contract Documents specifically provide otherwise.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Construction Manager and other Multiple Prime 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 or other Multiple Prime Contractors , the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. . Failure of the Contractor to report shall constitute an acknowledgment that the Owner's own forces or other Multiple Prime Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractor or to other Multiple Prime Contractors, because of the Contractor's improper actions, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of improper actions improperly timed activities, damage to the Work or defective construction by the Owner's own forces, or other Multiple Prime Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Multiple Prime Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and other Multiple Prime 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, other Multiple Prime 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.

§ 6.4 Should the Contractor sustain any damage through any act or omission of any other contractor having a contract with the Owner, or through any act or omission of any Subcontractor of said other contractor, the Contractor shall have no claim against the Owner for said damage.

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 and the Contractor shall proceed promptly , 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 and Section 9.7, a change in the Contract Sum or the Contract Time shall be accomplished only by written Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration of or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 7.1.4 The maximum combined overhead and profit included in the total cost to the Owner of a change in the Work shall be limited based on the following schedule:

.1 For the Contractor, Sub Contractor or Sub-Sub Contractors for Work performed shall be a maximum of 15 percent of the cost.

.2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section7.3.7.

.3 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over $2,000 be approved without such itemization.

.4 Contractor agrees to provide a complete breakdown of all costs or estimated costs in any level of detail requested by the Owner, Construction Manager, or Architect in regards to any change order item(s).

§ 7.1.5 Cost shall not be allowed in excess of usual rentals charged in area for similar equipment of like size and condition, including costs of necessary supplies and repairs for operating equipment on site in connection with other work unless its use incurs actual and additional costs to Contractor. If equipment not on site is required for change in work only, cost of transporting equipment to and from site will be allowed.

§ 7.1.6 Overtime, shall not be paid by the Owner.

§ 7.2 Change Orders

§ 7.2.1 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.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs and consequential damages associated with such change and any and all adjustments to the Contract Sum and the construction schedule.

§ 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 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and Architect 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.

§ 7.3.6 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.

> **§ 7.3.6.1** Costs for project management, estimating, main office personnel, field office personnel, warranty, hand tools, training programs, safety programs, insurances and bonds, and similar expenses may not be included in the direct costs of a change; they shall be considered overhead expenses.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the method and 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 allowance for overhead and profit as allowed in the Section 7.1.4, 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 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers compensation insurance;

.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. Unless otherwise established in the Contract, (1) the rental value of the Contractor's own equipment shall be not more than ten percent (10%) above the rates in the current edition "Compilation of Rental Rates for Construction Equipment" prepared by Associated Equipment Distributors, Oak Brook, Illinois, and (2) the aggregate amounts charged to the owner for such equipment shall not exceed ten percent (10%) above the fair market value;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision directly attributable to the change, excluding office personnel.

§ 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. The Contractor shall provide a credit for the reduced costs of bond and insurance premiums related to any credits for deleting Work or reductions in cost.

§ 7.3.8.1 The Schedule of Values shall be as legitimate and as accurate as possible since it may be used to compute credits for the deletion of Contract Work and to determine unit prices. The Schedule of Values amounts for each item shall include the Contractor's overhead and profit for that line item.

§ 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 Contractor shall provide detailed documentation of the actual costs for any change, including increased costs for bond and insurance premiums, if requested by the Owner, Architect, or Construction Manager.

§ 7.4 Minor Changes in the Work

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.2.1 The Contractor shall not commence Work on the site until two (2) certified copies of all insurance policies, as indicated in Article 11, attesting that the required coverage is in force, have been received and accepted by the Owner, Architect and Construction Manager.

§ 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 an act or neglect of the Owner, Owner's own forces, Construction Manager, Architect, any of the other Multiple Prime Contractors, or an employee of any of them; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties; or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration or by other causes that the Architect, based on the recommendation of the Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order, to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents, for such reasonable time as the Architect may determine.

The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by the Contractor, (ii) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay or reasonable likelihood that a delay will occur, and (iii) is of a duration not less than one (1) day.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under Section 8.3.1, shall be the sole remedy of the Contractor for any (i) delay in the commencement, prosecution, or completion of the Work, (ii) hindrance, interference, suspension or obstruction in the performance of the Work, (iii) loss of productivity, or (iv) other similar claims (items i through iv herein collectively referred to in this Section 8.3.3 as "Delays") whether or not such Delays are foreseeable, unless a Delay is caused by acts of the Owner constituting intentional interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages, in connection with any Delay, including, without limitation, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling, or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as intentional interference with the Contractor's performance of the Work.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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.

§ 9.2 Schedule of Values
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Construction Manager, within ten (10) days of full execution of this Agreement a schedule of values , allocating the entire Contract Sum to the various portions of the Work and prepared in such form, and supported by such data to substantiate its accuracy as, the Construction Manager and the Architect may require. 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. In the event there is one (1) Contractor, the Construction Manager shall forward to the Architect the Contractor's schedule of values. If there are Multiple Prime Contractors responsible for performing different portions of the Project, the Construction Manager, shall forward the Multiple Prime Contractors' schedules of values

§ 9.3 Applications for Payment
§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions, from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703, Continuation Sheet.

§ 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 material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until Substantial Completion in accordance with Section 9.8, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments and withhold payment of 5% retainage. Any time during construction the Owner shall retain two (2) times the amounts required to satisfy any outstanding liens, claims, judgments or disputes plus the 5% contract retainage. The value of any such amounts shall be as determined by the Owner, Architect and Construction Manager. Following Substantial Completion, the Owner shall pay the entire amount retained from previous progress payments less two (2) times the amounts required to complete any outstanding items and to satisfy any outstanding liens, claims, judgments or disputes. The value of any such amounts shall be as determined by the Owner, Architect and Construction Manager. Owner also reserves the right to withhold any amounts required to offset any apparent cost impacts that are made known to the Owner through the Contractor's suppliers and or sub-contractors as well as Work discovered or suspected to be non-compliant with the Contract Documents, which Work may have been previously paid for.

§9.3.1.4 With each Application for Payment, the Contractor shall supply Certified Monthly Payrolls for the month prior, and shall supply releases of lien from all sub-contractors and suppliers.

§ 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.

§ 9.3.2.1 All such materials and equipment stored on-site, but not yet incorporated into the Work, upon which partial payments have been made, shall become the property of the Owner, but the care and protection of such materials shall remain the responsibility of the Contractor until incorporation into the Work, including maintaining insurance coverage on a replacement cost basis without voluntary deductible.

§ 9.3.2.2 The Contractor shall provide copies of invoices and proof of insurance for any items that are stored off site along with any applications for payment requesting payment for such items.

§ 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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

.1 The Contractor further expressly undertakes to defend the Indemnitees, at the Contractor's sole expense, against any actions, lawsuits, or proceedings brought against the Indemnitees as a result of liens filed against the Work, the site of any of the Work, the Project site and any improvements thereon, payments due the Contractor, or any portion of the property of any of the Indemnitees (referred to collectively as "liens" in this Section 9.3.3). The Contractor hereby agrees to indemnify and hold the Indemnitees harmless against any such liens or claims of lien and agrees to pay any judgment or lien resulting from any such actions, lawsuits, or proceedings.

.2 The Owner shall release any payments withheld due to a lien or claim of lien if the Contractor obtains security acceptable to the Owner or a lien bond that is (i) issued by a surety acceptable to the Owner, (ii) in form and substance satisfactory to the Owner, and (iii) in an amount not less than one hundred fifty percent (150%) of such lien claim or such other amount as required by applicable law. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or obligations under this Section 9.3.3, including, without limitation, the duty to defend and indemnify the Indemnitees. The cost of any premiums incurred in connection with such bonds and security shall be the responsibility of the Contractor and shall not be part of, or cause any adjustment to, the Contract Sum.

.3 The Contractor agrees to waive any right it may have to assert a mechanic's or other lien against the Project site and any improvements thereon, including, without limitation, the Work itself. Furthermore, the Contractor will cause a similar provision, waiving any right to a mechanic's or other lien against the property, to be included in all of its subcontracts, any sub-subcontracts, and all contracts and purchase orders with material suppliers. Notwithstanding the foregoing, the Owner reserves the right to settle any disputed mechanic's or material supplier's lien claim by payments to the lien claimant or by such other means as the Owner, in the Owner's sole discretion, determines is the most economical or advantageous method of settling the dispute. The Contractor shall promptly reimburse the Owner, upon demand, for any payments so made if the amount paid exceeds the amount remaining owed under the subcontract.

§ 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 with a copy to the Owner. Within seven (7) days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either issue to the Owner a Certificate for Payment, with a copy to the Construction Manager; for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1; The Construction Manager will promptly forward to the Contractor and the Owner, the Architect's notice of withholding certification.

§ 9.4.2 Where there are multiple Prime Contractors performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives the Multiple Prime Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Multiple Prime Contractors'; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Multiple Prime Contractor's application with information from similar applications for progress payments from other Multiple Prime Contractors'; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Multiple Prime Contractors; and (5) forward the Summary of

Contractor's Applications for Payment and Project Application and Certificate for Payment to the Architect, with a copy to the Owner.

§ 9.4.3 Within seven 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 issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner, in writing, of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.4 The Construction Manager's certification of an Application for Payment or, in the case of Multiple Prime Contractors, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the information provided as part of the Application 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, and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner, that the Contractor be paid the amount certified.

Nothing in this Section shall reduce, diminish, or otherwise affect the Architect's responsibilities to the Owner for the evaluation and certification of the applications for payment or evaluation and certification of the extent of the Work performed by the Multiple Prime Contractors.

§ 9.4.5 The Architect's issuance of a Certificate for Payment or, in the case of Multiple Prime Contractors, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of 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, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.6 The representations made pursuant to Sections 9.4.4 and 9.4.5 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.

§ 9.4.7 The issuance of a separate 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 the Contractors' construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and material 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 9.4.4 and 9.4.5 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 9.4.3. 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 or subsequent observations, 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;
.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 for the anticipated delay;
.7 repeated failure to carry out the Work in accordance with the Contract Documents; or
.8 failure to maintain insurance as required by the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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.

§ 9.5.4 Notwithstanding anything above to the contrary, the Owner has the right to withhold payment to protect itself against damages incurred or which may be incurred as the result of the Contractor's breach of Contract or negligence, including, but not limited to, the items set forth in Section 9.5.1.

§ 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or shall 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 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure, any default of the Contractor or to correct defective Work , the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to (i) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (ii) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled .

§ 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 (14) days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within thirty (30) 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 (7) additional days' written 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 shut down, 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 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; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

§ 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, which shall identify all non-conforming, defective and incomplete Work and establish the date of commencement of warranties in connection with any such Work. 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 requirements of 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.

§ 9.8.3.1 Except with the consent of the Owner, the Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work , or designated portion thereof, is substantially complete, the Architect will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall ;establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment sufficient to increase the total payments to one hundred percent (100%) of the Contract

Sum, less twice the amounts as the Owner, Architect and Construction Manager shall determine for incomplete Work and unsettled and un-bonded liens, claims, judgments, or disputes . 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 as required under Section 11.3.1.5 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 with a copy to the Owner a written 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 with a copy to the Owner. Upon receipt, the Construction Manager will evaluate the completion of Work of the Contractor and then forward the notice and Application with the Construction Manager's recommendations 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 terms and conditions of 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.

§ 9.10.1.1 Except with the consent of the Owner, the Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.10.1.2 If additional time is needed to complete Work identified in the final inspection, the Architect may set the date starting the one-year corrective or warranty period at his/her discretion, but in no case later than the date of final payment. This date established as acceptance and start of warranty period is to be honored by the Contractor regardless of the Contractor's agreements with the product manufacturers in regards to warranties.

§ 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 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien, 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 such lien, , including all costs and reasonable attorneys' fees.

§ 9.10.2.1 In addition to the submittals required by Section 9.10.2, the Contractor shall submit other items as may be required by the Contract Documents and separate release or waivers of liens for each Subcontractor, material supplier, and others with lien rights against the property of the Owner, along with a list of all such parties.

§ 9.10.2.2 Upon demand by the Owner, Contractor shall provide and file bond for discharge of any lien, as required by Lien Law, State of New York, Section 21, Paragraph 5.

§ 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 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 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; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 The acceptance by the Contractor, Subcontractor, material supplier or its assignees, of the final payment under this Contract whether by voucher, judgment of any court of competent jurisdiction, or administrative means, shall constitute and operate as a general release to the Owner from any and all claims of the Contractor arising out of the performance of this Contract.
.

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.

§ 10.1.1 The Contractor shall comply with any safety requirements included in the Contract Documents, including but not limited to the OSHA Standards as required by New York State Labor Department. However, these shall be deemed to be minimum requirements and shall not relieve the Contractor of the responsibility for other safety precautions and programs in accordance with the requirements of Article 10.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable 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, or the Contractor's Subcontractor or Sub-subcontractors;

.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, 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 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 owners and users of adjacent sites and utilities.

The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor.

§ 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, and shall provide proof of relevant insurance coverage as may be required by Owner.

§ 10.2.4.1 When use or storage of hazardous materials, substances or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the Owner reasonable advance notice. If the Contract Documents require the Contractor to handle materials or substances that under certain circumstances may be designated as hazardous, the Contractor shall handle such materials in an appropriate manner.

§ 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 except damage or loss. 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, written notice of such 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 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and fully protect the Work, as necessary, from injury or damage by any cause.

§ 10.2.10 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent the contamination of any portion of the Project Site, property damage, or any foreseeable bodily injury or death to persons resulting from any material or substance, including but not limited to any material that may contain asbestos, lead, mercury, or polychlorinated biphenyl ("PCB"), encountered on the site by the Contractor, the Contractor shall immediately, upon recognizing any such potential condition, stop Work in the affected area and report the condition to the Owner and the Architect, both verbally and in writing.

§ 10.3.1.1 The Contractor shall thoroughly and carefully review the Project Site and any information available from the Owner to identify the known and potential locations of any known or suspected hazardous materials prior to commencing the Work. The Owner has provided in the Contract Documents a preconstruction survey by an independent testing company of the presence, location, and condition of hazardous materials.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify a 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 such material or substance or who are to perform the task of removal or safe containment of such 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

§ 10.3.3 Intentionally Left Blank

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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.

§ 10.3.5.1 The Contractor shall be held liable for the costs of remediation of a hazardous material or substance if the Contractor failed to take reasonable precautions with any potentially hazardous material that was encountered during the course of the Work.

§ 10.3.6 Intentionally Left Blank .

§ 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 Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain with a company or companies lawfully authorized to do business in the State of New York, County of Ulster such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract, and for which the

Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

.9 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- **a) Premises Operations (including X, C and U coverage as applicable)**
- **b) Independent Contractor's Protective**
- **c) Products and Completed Operations**
- **d) Personal Injury Liability**
- **e) Contractual, including specified provisions for Contractor's obligations in Section 3.18**
- **f) Owner, Non-Owned and Hired Motor Vehicles**
- **g) Broad Form Property Damage, including Completed Operations.**

.10 General Liability coverage must be made on an occurrence basis.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work for the life of this Contract (which includes the warranty or guaranty period) and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§11.1.2.1 The insurance required by Section 11.1.2 shall be written for not less than the limits in the following Clauses, or greater if required by law:

(Rev. 6-01-19)

PLEASE BRING THESE INSURANCE REQUIREMENTS TO YOUR INSURANCE AGENT TO ENSURE PROPER COVERAGE AND LIMITS ARE IN PLACE. FAILURE TO PROVIDE CERTIFICATE(S) OF INSURANCE EVIDENCING REQUIREMENTS BELOW, SHALL DELAY CONTRACT EXECUTION.

SCHEDULE C
COUNTY OF ULSTER CONTRACT INSURANCE REQUIREMENTS

I. CONDITIONS OF INSURANCE

Unless otherwise authorized by the Ulster County Insurance Officer, strict adherence to this schedule is required. Any deviation without prior authorization from the County's Insurance Department will result in a delay in the finalization of this Agreement.

The Contractor shall submit copies of any or all required insurance documents as and when requested by the County. Upon policy renewal, the Contractor shall submit updated insurance policy information.

II. CERTIFICATES OF INSURANCE

The Contractor shall file with the County's Insurance Department, prior to commencing work under this Agreement, all

proper Certificates of Insurance.

The Certificates of Insurance shall include:

a. Name and address of Insured
b. Issue date of certificate
c. Insurance company name
d. Type of coverage in effect
e. Policy number
f. Inception and expiration dates of policies included on the certificate
g. Limits of liability for all policies included on the certificate
h. "Certificate Holder" for all certificates shall be the County of Ulster, P.O. Box 1800, Kingston, New York 12402-1800.

If the Contractor's insurance policies should be non-renewed or canceled, or should expire during the life of this Agreement, the County shall be provided with a new certificate indicating the replacement policy information as requested above. The County requires thirty (30) days prior written notice of cancellation [ten (10) days for non-payment of premium] from the Insurer, its agents or representatives.

The Contractor agrees to indemnify the County of Ulster for any applicable deductibles and self-insured retentions.

III. WORKERS' COMPENSATION AND DISABILITY INSURANCE

The Contractor shall take out and maintain during the life of this Agreement, Workers' Compensation (WC) Insurance and Disability Benefits (DB) Insurance, for all of its employees employed at the site of the project, and shall provide Certificates of Insurance evidencing this coverage to the County's Insurance Department.

If the Contractor is not required to carry such insurance, the Contractor must submit form CE-200 attesting to the fact that it is exempt from providing WC and/or DB Insurance coverage for all of its employees.

The manner of proof related to WC and DB Insurance is controlled by New York State Laws, Rules and Regulations. "ACORD" forms are not acceptable proof of WC and/or DB Insurance.

IV. WORKERS' COMPENSATION REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 57, a business entity (the Contractor) seeking to enter into a contract with a municipality (the County) must provide one of the following forms to the municipal entity with which it is entering into a contract including a Waiver of Subrogation Endorsement. The Contractor should contact their insurance agent to obtain acceptable proof of WC coverage:

- Form C-105.2 – "Certificate of NYS Workers' Compensation Insurance" **or**
- Form U-26.3 – "Certificate of Workers' Compensation Insurance" issued by the New York State Insurance Fund **or**
- Form SI-12 – "Affidavit Certifying that Compensation has Been Secured" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured **or**
- Form GSI-105.2 – "Certificate of Participation in Workers' Compensation Group Self-Insurance" issued by the Self-Insurance administrator of the group **or**
- Form GSI-12 – "Certificate of Group Workers' Compensation Group Self-Insurance" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured.

If the Contractor is not required to carry WC coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at http://www.wcb.ny.gov

V. DISABILITY BENEFITS REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 220(8), a business entity (the Contractor) seeking to enter into a contract with a municipality (the County) must provide one of the following forms to the municipal entity it is entering into a contract with. The Contractor should contact their insurance agent to obtain acceptable proof of DB Insurance Coverage:

- Form DB-120.1 – "Certificate of Insurance Coverage Under the NYS Disability Benefits Law" **or**
- Form DB-155 – "Compliance with Disability Benefits Law" issued by the Self-Insurance Office of the Workers' Compensation Board if the Contractor is self-insured.

If the Contractor is not required to carry DB Insurance coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at http://www.wcb.ny.gov

VI. COMMERCIAL GENERAL LIABILITY INSURANCE

The Contractor shall take out and maintain during the life of this Agreement, such bodily injury liability and property damage liability insurance as shall protect it and the County from claims for damages for bodily injury including accidental death, as well as from claims for property damage that may arise from operations under this Agreement, whether such operations be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either of them.

It shall be the responsibility of the Contractor to maintain such insurance in amounts sufficient to fully protect itself and the County, but in no instance shall amounts be less than the minimum acceptable levels of coverage set forth below:

- Bodily Injury and Property Damage Liability Insurance in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** for each occurrence, and in an amount not less than **FOUR MILLION AND 00/100 ($4,000,000.00) DOLLARS** general aggregate.

Other Conditions of Commercial General Liability Insurance:

a. Coverage shall be written on Commercial General Liability form.
b. Coverage shall include:
    1. Contractual Liability
    2. Independent Contractors
    3. Products and Completed Operations
    4. Pollution Liability when required
    5. Owners and Contractors Protective Liability
c. "Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York, 12402-1800", shown on the Commercial General Liability policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

VII. UMBRELLA LIABILITY OR EXCESS LIABILITY INSURANCE

Umbrella Liability or Excess Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS**.

NOTE: As long as all minimum underlying limits have been met, insurance limits may be a total combined limit of the Umbrella/Excess Liability limits and the underlying liability insurance limits.

The Umbrella/Excess Liability coverage MUST be written on a follow-form (drop down) basis to the underlying insurance coverage with no additional exclusions.

"Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York, 12402-1800", shown on the Umbrella policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

VIII. AUTOMOBILE LIABILITY INSURANCE

Automobile Bodily Injury Liability and Property Damage Liability Insurance shall be provided by the Contractor, with a minimum Combined Single Limit (CSL) of **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS.**

Coverage shall include:

a. All owned vehicles
b. Any hired automobile
c. Any non-owned automobile
d. "Additional Insured" status shall be granted to "County of Ulster, P.O. Box 1800, Kingston, New York,

12402-1800", shown on the Auto Liability policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance.

IX. POLLUTION LIABILITY INSURANCE

[X] If this box is checked, Pollution Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000) DOLLARS** for each occurrence and in an amount of not less than **FIVE MILLION AND 00/100 ($5,000,000) DOLLARS** general aggregate.

X. PROFESSIONAL LIABILITY INSURANCE (e.g. MALPRACTICE, MEDIA LIABILITY, ERRORS & OMISSIONS INSURANCE)

[ ] If this box is checked, Professional Liability Insurance shall be provided by the Contractor in an amount not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS** for each occurrence and in an amount of not less than **FIVE MILLION AND 00/100 ($5,000,000.00) DOLLARS** general aggregate.

XI. RIGGERS LIABILITY INSURANCE

[X] If this box is checked, Riggers Liability Insurance shall be provided by the Contractor in an amount not less than **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS** for each occurrence and in an amount of not less than **ONE MILLION AND 00/100 ($1,000,000.00) DOLLARS** general aggregate.

XII XCU (Explosion, Collapse, and Underground) Endorsement/Commercial General Liability Coverage:

[ ] If this box is checked, an Explosion, Collapse, and Underground Endorsement shall be provided by the Contractor in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** for each occurrence, and in an amount not less than **TWO MILLION AND 00/100 ($2,000,000.00) DOLLARS** general aggregate.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Construction Manager, the Construction Manager's consultants, the Owner, the Architect, and the Architect'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 during the Contractor's completed operations; and (3) The Contractor's policies shall be with limits equal to or greater than the limits in Section 11.1.2.; and (4) insurers must provide 30-day notice of cancellation to all additional insureds.

§11.1.5 If the Contractor has an exclusion on his/her insurance policy for Pollution/Hazardous Materials that are part of this project then his/her Sub-Contractor performing the Work must provide that insurance.

§11.1.6 Both the binder and the insurance policy must be submitted prior to any Work being performed on the Owner's Site. The policy must match the binder.

§11.1.7 The Contractor's failure to take out or to maintain, or the taking out or maintenance of any required insurance, shall not relieve Contractor from any liability under this Agreement, nor shall the insurance requirements be construed to conflict with or limit Contractor's obligations concerning indemnification. All property losses shall be made payable to and adjusted with the Owner. All Certificates of Insurance shall be approved by Owner's Insurance Officer prior to commencement of any Work under this Contract.

§ 11.2 Owner's Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 Property Insurance

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's, Contractor's, and Construction Manager's services and expenses required as a result of such insured loss. The form of policy for this coverage shall be Completed Value. Any loss under the property coverage will have a deductible payment of $10,000.00, which shall be the responsibility of the causing party.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the causing party shall pay costs not covered because of such deductibles.

§ 11.3.1.4 The Contractor shall provide insurance coverage acceptable to Owner for portions of the Work stored off site, in transit, and stored on site but not incorporated into the Work as full replacement cost basis without voluntary deductible.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 Intentionally Left Blank

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 Waivers of Subrogation. 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, and (2) the Construction Manager, Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or distribution of insurance proceeds in accordance with the direction of the arbitrators.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising hereunder. Bonds shall be obtained through a Surety satisfactory to the Owner and licensed to do business in the State of New York and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

The Surety shall have, at a minimum a "Best Rating" of "AA+" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty". In addition, the Surety shall have a minimum "Best Financial Strength Category" of "Class V".

§ 11.4.1.1 The Contractor shall deliver the required bonds to the Owner, on AIA Document A312, not later than ten (10) days following the Notice of Award, or if the Work is to be commenced prior thereto in response to a letter of intent, the

Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

§ 11.4.1.2 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.

§ 11.4.1.3 The insurance required by Section 11.4 is not intended to cover machinery, tools or equipment owned or rented by the Contractor that are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools, or equipment, which shall be subject to the provisions of Section 11.3.7.

§ 11.4.2 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.

§ 11.5 Maintaining Insurances

§ 11.5.1 The Contractor's failure to maintain any of the insurances required by Article 11 shall be cause for the Owner to withhold payment per Section 9.5.1.8.

§ 11.5.2 The Owner reserves the right to provide additional insurance at the Contractor's expense if the Contractor fails to update their insurance.

§ 11.5.3 The Contractor shall submit updated certificates of Insurance to the Construction Manager for transmittal to the Owner per Section 11.1.3.

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 observation 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 which the Construction Manager or Architect has not specifically requested to observe 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, costs of uncovering and replacement shall by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs, and the cost of correction, shall be at the Contractor's expense, unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After 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, whether discovered before or after Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including, but not limited to, additional testing and inspections, the cost of uncovering and replacement, the cost of repairing work of other Contractor's damaged or destroyed by the Contractor, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

If prior to the date of Substantial Completion the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner or Construction Manager. In addition, the Contractor shall promptly remedy damage and loss arising in conjunction with the Project 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 anyone for whose acts they may be liable or for which the Contractor is otherwise responsible.

§ 12.2.1.1 Should Contractor fail to remove and replace promptly any rejected Work, Owner shall have the right itself or through others to dismantle and remove the same and to purchase and install new materials and equipment in replacement thereof, and the cost thereof together with the cost of repairing all other Work destroyed or damaged by such removal or replacement may be deducted from any payment or payments due or to become due to Contractor. If such payment or payments shall be insufficient for such purpose or if Contractor shall have been fully paid, Contractor shall on demand pay such cost to Owner.

§ 12.2.1.2 Should Owner determine that such removal is inexpedient, Owner shall have the right to accept such defective Work and deduct from any payment or payments due or to become due to Contractor, an amount determined by Owner to be the equivalent of the difference in value between the portion of the Work as required by the Contract Documents and such portion as furnished by Contractor. If such payment or payments due or to become due shall be insufficient for such purpose or if Contractor shall have been fully paid, Contractor shall pay to Owner on demand any deficiency or difference in value.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of an 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 correct it promptly after receipt of written 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 or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period 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 Upon completion of any Work under or pursuant to this Section 12.2, the one (1)-year correction period in connection with the Work requiring correction shall be renewed and recommence. The obligations under Section 12.2 shall cover any repairs and replacement to any part of the Work or other property that is damaged by the defective Work.

§ 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 whether completed or partially completed, of the Owner or separate contractors or other Multiple Prime Contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents. The obligations shall cover any repair and replacement to any part of the Work or other property caused by the defective Work.

§ 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, nor the warranty period for any equipment provided in connection with 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

This Contract shall be governed by the laws of the State of New York, except where the Federal Supremacy Clause requires otherwise.

§ 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 such 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 such assignment.

§ 13.3 Written Notice

§ 13.3.1 Legal Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity or to an officer of the corporation for which it was intended; or if delivered at or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice. In addition to the methods of service allowed by New York State Law, Contractor consents to service of process by registered or certified mail, return receipt requested or by facsimile (fax) transmission. Service shall be complete and effective when deposited in a United States mailbox or post-office or when fax has connected. Contractor must promptly notify Owner, in writing, of each and every change of address or fax number to which service of process can be made. Service by Owner to the Contractor's last known address or fax number shall be sufficient. Contractor will have fifteen (15) calendar days after service is complete in which to respond.

§13.3.1.1 Contractor agrees that at least ninety (90) days prior to commencing suit against the Owner for any matter arising directly or indirectly out of this Contract, it shall provide to the Owner a sworn document listing the time, place and manner of any breach of this Contract, together with a list of any damages to which Contractor believes it is entitled.

§13.3.1.2 Owner shall have a right to conduct a deposition upon oral questions of an officer, employee or agent of the Contractor of the Owner's choice, as to any matter arising under this Contract, within the ninety (90) day period prescribed in Section13.3.1 above.

§13.3.1.3 Strict compliance with this Section 13.3 shall be a condition precedent to maintenance or institution of any action or proceeding, whether legal or administrative. This section shall not be construed to toll any applicable statute of limitations.

§13.3.1.4 Any action against Owner must be commenced within one year of the event that gives rise to liability.

§13.3.2 Other Than Legal Notice Any invoice, statement, notice or communication other than legal notice as provided for in Section 13.3.1 shall be made in writing at the addresses listed in the Contract.

§ 13.4 Rights and Remedies

§ 13.4.1 Except as expressly provided in the Contract Documents, 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.

§ 13.4.2 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 in writing.

§13.4.3 The Owner shall have all of its common law, equitable and statutory rights of set off. These rights shall include, but not be limited to the Owner's option to withhold for the purpose of set-off any monies due Contractor under this Contract up to any amounts due and owing to Owner with regard to this Contract, any other Contract you may have or have had with the Owner or any of its departments or agencies. This right of set-off includes any agreement for a term

commencing prior to or subsequent to the term of this Contract. The right of set-off shall include any amounts due to the Owner for any reason including, without limitation, tax delinquencies, fee delinquencies, or monetary penalties relative thereto.

§ 13.5 Tests and Inspections

§ 13.5.1 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 (1) tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections, or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.1.1 The Owner shall hire the Special Inspector, at the Owner's expense, to conduct all Special Inspections and related testing as outlined in the Contract Documents. The Contractor shall cooperate with the Special Inspector and shall coordinate his/her schedule and activities with the Construction Manager who will schedule the Special Inspector. The Contractor shall be responsible for the costs of any additional Special Inspections that are required for the re-inspection of Work that has failed to comply with requirements and for additional inspections required as a result of the Contractor's failure to properly coordinate its schedule with the Special Inspector.

§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection, or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

§ 13.5.5 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.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5.7 Any material to be furnished shall be subject to inspections and tests in the shop and field by the Architect. Shop inspection shall not relieve the Contractor of the responsibility to furnish satisfactory materials and the right is reserved to reject any material at any time before final acceptance of the work, when in the opinion of the Architect the materials and workmanship do not conform to the Specification requirements.

§ 13.6 Intentionally Left Blank

§ 13.7 Time Limits on Claims

The Owner and the Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in

any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and the Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

§ 13.8 Intentionally Left Blank

§ 13.9 Wage Rates

§ 13.9.1 The Contractor shall comply with the current Prevailing Wage Rates as issued by the State of New York Department of Labor for the location and duration of this Project.

§ 13.11 Certified Payroll Reports

§ 13.11.1 The Contractor shall submit certified copies of payroll records to the Owner concurrent with any Application for Payment. The payroll records shall comply with New York State Labor Law Article 8. The Owner shall not be required to make payment if the appropriate payroll records have not been received.

§ 13.12 No Oral Waiver

The provisions of the Contract Documents shall not be changed, amended, waived, or otherwise modified in any respect except by a writing signed by Owner. No person is authorized on behalf of Owner to orally change, amend, waive, or otherwise modify the terms of the Contract Documents or any of the Contractor's duties or obligations under or arising out of the Contract Documents. Any change, waiver, approval, or consent granted to the Contractor shall be limited to the specific matters stated in the writing signed by Owner, and shall not relieve Contractor of any other of the duties and obligations under the Contract Documents. No "constructive" changes shall be allowed.

§ 13.13 Notices Regarding Liens

13.13.1 Contractor shall provide and file, as required by law, all notices required or permitted by the laws of the state in which the Project is located for protection of Owner from liens and claims of lien if permitted or required by applicable law. Contractor shall be responsible for filing in the appropriate court or other governmental office records all such notices as required or permitted by the laws of the state in which the Project is located.

13.13.2 Contractor shall provide Owner with copies of all notices received by Contractor from subcontractors, sub-subcontractors, and/or suppliers to Contractor.

§ 13.14 General Provisions

13.14.1 Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and are also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

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 ninety (90) consecutive days through no act or fault of the Contractor, or a Subcontractor, Sub-subcontractor, or their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the contractor, 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; or
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, or a Subcontractor, Sub-subcontractor, or their agents or employees, or any other persons or entities performing portions of the Work, under direct or indirect contract with the Contractor, 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 twenty-one (21) days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 14.1.4 If all of the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor, or a Subcontractor, or their agents or employees, or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently 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 (7) additional days' written 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** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.
- **.5** breaches any warranty made by the Contractor under or pursuant to the Contract Documents;
- **.6** fails to furnish the owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents; or
- **.7** fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, 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 (7) days' written 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 Architect 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 Intentionally Left Blank

§ 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 written 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 Contractor shall be entitled to receive payment for Work executed, including overhead and profit, and; costs incurred by reason of such termination.

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, 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.

§ 15.1..2 Notice of Claims

Claims by either the Owner or Contractor must, be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Construction Manager and or Architect is not serving as the Initial Decision Maker; provided, however, that the claimant shall use its best efforts to furnish the Initial Decision Maker and the other party, as expeditiously as possible, with notice of any Claim including, without limitation, those in connection with concealed or unknown conditions, once such claim is recognized, and shall cooperate with the Architect, the Construction Manager, and the party against whom the claim is made in any effort to mitigate the alleged or potential damages, delay, or other adverse consequences arising out of the condition that is the cause of such a Claim. Claims by either party must be initiated within twenty-one (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. In addition to the methods of service allowed by New York State, Contractor consents to process by registered or certified mail, return receipt requested. Service shall be complete and effective when deposited in a United States mailbox or post transmission. Contractor must notify Owner and Architect promptly, in writing, of each and every change of address to which service can be made. Service by Owner at the last known address shall be sufficient. Owner will not accept service by Facsimile. The Contractor shall submit all claims for additional cost in writing to the Architect and the Construction Manager, and shall obtain a written response from the Architect prior to proceeding with the Work. Failure of the Contractor to provide written notice to both the Architect and the Construction Manager of any claim in accordance with these requirements shall constitute a waiver of the Contractor's rights to any additional cost or any extension of time related to such claim.

§ 15.1.3 Continuing Contract Performance

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. The Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3.. Failure of the Contractor to properly file a claim in accordance with the requirements of the Contract Documents shall constitute a waiver of that claim.

§ 15.1.4.1 The Owner shall not be liable to any Contractor or any subcontractor for any charges or claims for damages for any delays or hindrances, from any cause whatsoever, occurring during the progress of any portion of the Work. Such delays or hindrances shall be compensated for by an extension of time as provided in Section 15.1.5.

§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions at the Project site were extremely abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, any and all impacts known or being considered, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor. Any claim for additional time must be supported by documentation showing how the delay contributed to the impact of any and all tasks that are or were in the "critical path" of the Project schedule in effect at the time of impact.

§ 15.1.6 Waiver of Consequential Damages. The Contractor waives Claims against the Owner, Construction Manager, and the Architect for consequential damages arising out of or relating to this Contract, with the exception of the loss of profit anticipated directly from this Project. This waiver includes, but is not limited to: damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financial, business and reputation, and for loss of profit from other projects.

§ 15.1.7 The Contractor shall provide detailed documentation for each claim that fully substantiates the amount for any additional cost or the extent of any extension of time. Such documentation shall be submitted in a timely manner, and in a detail and format acceptable to the Architect and Construction Manager.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9 and 11.3.10, shall be referred to the Initial Decision Maker for 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, a decision by the Initial Decision Maker shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless sixty (60) days have passed after the Claim has been referred to the Initial Decision Maker with no 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 (10) days after receipt of such 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 and, the Architect and Construction Manager, if the Architect or Construction

Manager 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 If a claim, dispute or other matter in question arises out of or relates to this Contract or its breach, the parties shall endeavor to settle the dispute first through direct discussion. If the dispute cannot be settled by direct discussion the parties agree that any action or proceeding arising under this Contract shall be brought in a New York State court of competent jurisdiction in Ulster County. It is expressly agreed that there will be no arbitration as to any matters arising out of or relating to the Contract Documents.

§ 15.2.6.1 Either party may, within thirty (30) days from the date of an initial decision, demand in writing that the other party file for mediation within sixty (60) days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 Intentionally Left Blank

§ 15.4 Intentionally Left Blank

SECTION 00 73 43.02

NYS DEPT OF LABOR OSHA TRAINING REQUIREMENTS

Requirements for OSHA 10 Compliance

Chapter 282 of the Laws of 2007, codified as Labor Law 220-h took effect on July 18, 2008. The statute provides as follows:

The advertised specifications for every contract for public work of $250,000.00 or more 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 contract."

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 518-485-5696.

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 00 73 49

LABOR STABILIZATION AGREEMENT

PROJECT LABOR AGREEMENT

COVERING CONSTRUCTION

OF

ULSTER COUNTY GOVERNMENT OPERATIONS CENTER

Table of Contents

PROJECT LABOR AGREEMENT

PREAMBLE

WHEREAS, County of Ulster ("County") desires to provide for the cost efficient, safe, quality, and timely completion of the ("ULSTER COUNTY GOVERNMENT OPERATIONS CENTER") project in a manner designed to afford the lowest reasonable costs to the County, and the public it represents, and the advancement of permissible statutory objectives;

WHEREAS, the County of Ulster engaged Arace & Company ("Arace") to undertake a study of which a copy is on file with the "County" of whether the use of a Project Labor Agreement will best serve the County's interest in obtaining the best work at the lowest possible price, preventing favoritism, fraud and corruption, and other considerations such as the impact of delay, the possibility of cost saving advantages, and any local history of labor unrest; and

WHEREAS, the Arace Due Diligence Assessment of the Impacts and Implementation of a Project Labor Agreement, (the "Study"), concluded that use of a Project Labor Agreement would provide the County with measurable economic benefits and would promote the County's interest in obtaining the best work at the lowest prices as well as preventing favoritism, fraud and corruption; and

WHEREAS, pursuant to resolution number 754 of December 2023, the County has carefully reviewed and considered the Study and determined, among other things, that the County's interest in obtaining the best work at the lowest possible price, preventing favoritism, fraud and corruption, preventing the impact of delay owing to labor unrest, obtaining cost savings advantages, and gaining measurable management flexibility and benefits are best met by requiring a Project Labor Agreement and, therefore, directs that a Project Labor Agreement be made part of the Project; and

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

(1) expediting the construction process and otherwise minimizing the disruption to the project;
(2) avoiding the costly delays of potential strikes, slowdowns, and walkouts arising from work disputes and promoting labor harmony and peace for the duration of the project;
(3) standardizing the terms and conditions governing the employment of labor on the project;
(4) permitting flexibility in work scheduling where necessary at affordable pay rates;
(5) permitting adjustments to work rules and staffing requirements from those which otherwise might apply;
(6) providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;
(7) promoting work opportunities for those within the County of Ulster and surrounding areas.
(8) ensuring a reliable source of skilled and experienced labor;

WHEREAS, County of Ulster, has, through independent investigation and analysis, determined the likelihood of substantial cost savings to the Project will result from the application of this Agreement; and

WHEREAS, Hudson Valley Building & Construction Trades Council, and its affiliated Local Unions and their members, desire to provide for stability, security and work opportunities which are afforded by a Project Labor Agreement; and

WHEREAS, the Parties desire to maximize project safety conditions for both workers and others;

NOW, **THEREFORE,** the Parties enter into this Agreement:

ARTICLE 1 — PARTIES TO THE AGREEMENT

SECTION 1.1 PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into for all Project construction, as defined herein, as part of the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER Project (as defined below) between (i) the Palombo Group on behalf of County of Ulster ("County") (ii) the Hudson Valley Building and Construction Trades Council ("Council") on behalf of itself and its affiliated Local Unions ("Local Unions"); and (iii) the signatory Local Unions on behalf of themselves and their members.

ARTICLE 2 - GENERAL CONDITIONS SECTION

SECTION 2.1 DEFINITIONS

Throughout this Agreement:

(A) "Contractor(s)" means any contractor and subcontractors of whatever tier engaged in Project Work within the scope of this Agreement as defined in Article 3, subject to exclusions defined in Section 3.3; 20.3 and 20.4.

(B) "Council" means the Hudson Valley Building & Construction Trades Council, AFL-CIO.

(C) "Local Union(s)" means the Local Unions signatory to this Agreement, individually and collectively.

(D) "Owner" means County of Ulster ("County").

(E) "Owner's Representative" means any Construction Manager or other individual or entity designated by the Owner to enter into this Agreement or otherwise act on its behalf.

(F) "The Project" means the work to be performed in connection with all construction

of the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER project as more fully set forth in Article 3, Section 3.1, subject to exclusions defined in Sections 3.3, 20.3 and 20.4.

(G) "Project Work" means the work covered by this Agreement and fully defined in Article 3, Section 3.1, subject to exclusions defined in Section 3.3; 20.3 and 20.4.

(H) **"Schedule A"** means and refers to collective bargaining agreements of affiliated Local Unions.

(I) "Union Parties" and "Unions" means the Hudson Valley Building & Construction Trades Council, AFL-CIO and the signatory Local Unions to this Agreement, individually and collectively.

SECTION 2.2 CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions are met: (1) the Agreement is signed by the Council and the Local Unions having jurisdiction over the Project Work; (2) the Agreement is approved by the NYS Building & Construction Trades Council (NYSBCTC); (3) the Agreement is approved by the Building & Construction Trades Department (BCTD); (4) the Agreement is authorized by the Owner and signed by the Owner and Construction Manager (CM).

SECTION 2.3 ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all signatory Unions and their affiliates and all Contractors performing Project Work as defined in Article 3, subject to exceptions in Sections 3.3, 20.3 and 20.4. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement a requirement that their Subcontractors, of whatever tier, become bound by this Agreement with respect to that subcontracted Project Work performed within the scope of Article 3, and require that each Subcontractor, of whatever tier, sign a Letter of Assent (Schedule B). This Agreement shall be administered by the Designee named by the Owner pursuant to Schedule C.

SECTION 2.4 SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto and referred to herein as "Schedule A" represents the complete understanding with respect to the Project and supersedes any national agreement, local agreement, or other collective bargaining agreement of any type which would otherwise apply to Project Work, in whole or in part, with the following exception: to the extent a Contractor is a signatory to the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors (the "National Agreements"), those National Agreements shall apply, except that when Contractor is also a signatory to an agreement listed in Schedule A hereof, Articles 7, 8, 9, and 10 of this Agreement

shall prevail over the applicable National Agreement and any Schedule A agreement . Where a subject covered by the provisions of this Agreement is also covered by a Schedule A agreement, the provisions of this Agreement shall prevail. If this Agreement is silent on any matter addressed in the applicable Schedule A agreement, the Schedule A agreement shall govern. It is understood that by virtue of having become bound by this Project Labor Agreement, the Contractors will not be obligated to sign any other local, area, or national agreement.

SECTION 2.5 LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Contractors, and Subcontractors shall not be liable for any violations of this Agreement by any other Contractor or Subcontractor; and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Union. Notwithstanding the above, every signatory to the Agreement further acknowledges that it will be liable for its own breach, partial breach or otherwise, whether related or not to the breach of another signatory. The County as Owner is not a party to the Agreement and shall not be liable in any manner under this Agreement.

SECTION 2.6 THE BID SPECIFICATIONS

The Owner shall require in its bid specifications for all Project Work within the scope of Article 3 that all successful bidders and their Subcontractors of whatever tier (unless otherwise excepted under this Agreement) become bound by this Agreement. Every Contractor shall require its Subcontractors, of whatever tier, to execute the Letter of Assent in Schedule B and to become bound by this Agreement. It is understood that nothing in the Agreement shall be construed as limiting the sole discretion of the Owner in determining which Contractor shall be awarded contracts for Project Work.

SECTION 2.7 AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

This Agreement shall be binding on all signatory Unions and their affiliates, and all Contractors, Unions and/or non-Unions performing Project Work, unless otherwise excepted under this Agreement. Unless expressly provided for in this Agreement, this Agreement shall not apply to the work of any Contractor which is performed at any location other than the site of Project Work.

ARTICLE 3 - SCOPE OF THE AGREEMENT

SECTION 3.1 PROJECT WORK

This Agreement shall only apply to Project Work as defined in this Article.

Subject to the exclusions in this Article, Project Work means solely that work performed

in connection with construction of the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER Project located at Paradies Lane, Town of New Paltz, New York. Project Work, unless otherwise excepted under Sections 3.3, 20.3 or 20.4, shall include all sitework, utilities, demolition, environmental work, MEP's and all construction related to the project.

SECTION 3.2 TIME LIMITATIONS

A. To be covered by this Agreement, Project Work must be awarded after the effective date of this Agreement.

B. This Agreement shall expire upon completion and acceptance by the Owner of this project.

C. The Agreement may be extended by written mutual agreement of the parties.

D. The Owner has sole discretion at any time to terminate, delay, or suspend the work, in whole or in part on the Project.

SECTION 3.3 EXCLUDED EMPLOYEES

Notwithstanding the provisions of Section 3.1 of this Article, the following person/entities are not subject to the provisions of this Agreement even though performing work on or in connection with the Project:

A. Superintendents, supervisors (excluding general and forepersons specifically covered by a craft's Schedule A), engineers, inspectors and testers, quality control/assurance personnel, design personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards employed by Owner, technicians, non-manual employees, and all professional, engineering (except field surveyors), administrative and management persons;

B. Employees of the Project Owner;

C. Employees and entities engaged in off-site manufacture, modifications, repairs, maintenance, or painting, handling or fabrication of project components, materials, equipment, or machinery except for any local deliveries of materials such as fill, ready mix, asphalt, concrete and other aggregates and removal of non-contaminated construction debris, which shall be covered under this Agreement.

D. Employees of the Construction Manager, except that performing manual, onsite construction labor who will be covered by this Agreement.

E. Employees engaged in onsite equipment warranty work;

F. Employees engaged in geophysical testing (whether land or water) other than boring for core samples;

G. Employees engaged in laboratory or specialty testing or inspections, unless ordinarily done by a member of a Trade Union;

H. Employees engaged in ancillary Project Work performed by third parties such as electric utilities, gas utilities, telephone companies, and railroads. Utility work provided by gas, electric, and cable companies, which is not performed by utility company employees, shall be subject to the terms of this Agreement.

I. Employees of contractors or vendors listed in Schedule G as described.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 4.1 PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all craft employees who are performing Project Work within the scope of Article 3 of this Agreement.

SECTION 4.2 UNION REFERRAL

A. The Contractors agree to hire craft employees for Project Work covered by this Agreement through the job referral systems and hiring halls established in the Local Unions' area collective bargaining agreements (attached as Schedule A to this Agreement), where those referrals meet the qualifications set forth in items 1, 2, and 4 of subparagraph B. The Unions agree to provide such craft employees (including apprentices) to all Contractors on a non-discriminatory basis. Notwithstanding this, Contractors shall have sole right to determine the competency of all referrals; the number of employees required; and the selection of employees for layoff (subject to Article 5, Section 5.3). In the event that a Local Union is unable to fill any request for qualified employees within a 48-hour period after such requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of craft employees hired for Project Work within its jurisdiction from any source other than referral by the Union. The Local Unions will cooperate with Contractor requests for minority, women, or economically disadvantaged referrals to meet the goals of Article 4, Section 4.4. These workers may be delivered under a "Direct Entry" designation or by use of a Department of Labor waiver.

B. A Contractor may request by name, and the Local Union will honor, referral of persons who have applied to the Local Union for Project Work and who meet the following qualifications:

(1) possess any license required by New York State law for the Project Work to be performed;
(2) Have worked a total of at least 1000 hours in the construction craft during the prior two years, and
(3) Were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award.
(4) Have the ability to safely perform the basic functions of the applicable trade.

C With the exception of Section 4.2(g) below, no more than twelve and a half (12.5%) per centum of the employees covered by this Agreement, per Contractor by craft, shall be hired through the provisions of Paragraph B of this section (any fraction shall be rounded to the next highest whole number). Craft forepersons and/or general forepersons shall be included in these twelve and a half (12.5%) percent. If requested by the appropriate Union, a Contractor utilizing this provision for by-name referrals shall furnish the Union with a written certification that the individuals requested for referral meet the requirements of (1) - (5) above.

D The Local Unions shall exert their utmost efforts to recruit sufficient numbers of skilled craft workers to fulfill the manpower requirements of the Contractor. When a Contractor of any tier is contracted to perform Project Work and such Contractor is not signatory to a Schedule A agreement (not including signatory through this Agreement) and the Union cannot provide ample labor to support the construction schedule or project, then the Contractor shall hire outside the Union hiring halls and the Contractor shall, at their discretion, replace the non-Union or non-dispatched employee when notified by the Union that labor has become available through the Union. The Contractor shall use other employees affiliated with the Council before hiring except, where specifically addressed in this Agreement if those employees from the other Unions have the required trade skills to perform the Project Work. Those hired through this provision shall be laid off before those of an affiliated Union.

E. Notwithstanding the foregoing, the "County" shall have the sole discretion to request that a person be removed from working on this Project.

F Due to specialty work related to construction of communications tower, contractors or subcontractors involved directly in the erection of the tower up to fifty percent (50%) of the employees covered by this Agreement, by craft shall be hired through the provisions of Paragraph B of this section. Craft forepersons and/or general foreman shall be included in the fifty percent (50%). If requested by the appropriate Union, the contractor or subcontractor utilizing this provision shall furnish the Union with written certification that the individuals requested for referral meet the requirements of 4.2(B) (1-5). For clarity, this provision applies directly and only to those employees' installing the tower and does not

include other work associated with the tower including but not limited to, site work, excavation, concrete, backfilling, or associated non-tower work.

G Due to specialty work related to geothermal, contractors or subcontractors involved directly in installation of geothermal up to 33.3% of the employers covered by this Agreement, by craft shall be hired through the provisions of paragraph B of this section. Craft forepersons and/or general foreman shall be included in these fifty percent (33.3%). If requested by the appropriate Union, the contractor or subcontractor utilizing this provision shall furnish the Union with written certification that the individuals requested for referral meet the requirements of 4.2(B) (1-5). For clarity, this provision applies directly and only to those employees' installing pipework outside the building, grouting and drilling and does not include other work associated with geothermal including but not limited to, site work, excavation, backfilling, or associated work inside the building.

SECTION 4.3 NON-DISCRIMINATION IN REFERRALS

A. The Local Unions represent that their hiring halls and referral systems shall be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of Union membership, policies, or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's Union membership, or lack thereof.

SECTION 4.4 WORKFORCE DIVERSITY UTILIZATION

A. The Unions recognize and acknowledge that workforce diversity of minorities and women are employment goals consistent with our values of fair play. The Local Unions agree and will strive to utilize their best efforts to provide qualified minority and female applicants.

SECTION 4.5 CROSS AND QUALIFIED REFERRALS

The Local Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions shall exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fiilfill the requirements of each Contractor.

SECTION 4.6 UNION DUES

Nothing in this Agreement requires employees to join a Union or pay dues or fees to a Union as a condition of working on the Project. This Agreement is not, however, intended to supersede independent requirements in applicable Local Union Agreements as to Contractors that are otherwise signatory to those Agreements in relation to employees of such Contractors performing Project Work.

ARTICLE 5 — UNION REPRESENTATION

SECTION 5.1 LOCAL UNION REPRESENTATIVE

Each Local Union signatory to this Agreement shall be entitled to designate a representative and/or Business Manager who shall be afforded access to the Project site only during times when Project Work is being conducted.

SECTION 5.2 STEWARDS

A. Each Local Union shall have the right to designate from among those referred to the Project a working journey person as a Steward or Lead Engineer and one alternate per shift, and shall notify the Construction Manager of the identity of the designated Steward or Lead Engineer (and alternate) prior to the assumption of such duties. Stewards or Lead Engineer shall not exercise supervisory functions and shall receive the rate of pay for their craft classifications. There will be no non-working Stewards or Lead Engineer on the Project.

B In addition to his/her work as an employee, the Steward or Lead Engineer shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor; such activities, however, are not to interfere with the Steward's work unless an emergency situation exists. Each Steward or Lead Engineer shall be concerned with the employees of the Steward's Contractor and, if applicable, Subcontractors of that Contractor, but not with the employees of any other Contractor. The Contractor will not discriminate against the Steward or Lead Engineer in the proper performance of Union duties.

C. Requirements for stewards or lead engineer shall be as per the applicable Schedule A agreement.

SECTION 5.3 LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward or Lead Engineer, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A agreement, such provisions shall be recognized to the extent the Steward or Lead Engineer possesses the necessary qualifications to perform the Project Work

required. In any case in which a Steward or Lead Engineer is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

SECTION 5.4 UNION STANDARDS

A. The Council and its affiliates have a legitimate interest in preventing the undermining of the work opportunities and standards gained through collective bargaining and desire to preserve and protect work opportunities for its members.

B. The County, while recognizing this interest, must maintain its ability to utilize the services of off-site fabricators and those entities involved in deliveries of construction materials, except those materials included in Section 3.3, when not covered under New York State Labor Law 220.

C. While the scope of the Agreement is limited to Project Work as defined and subject to exceptions herein, Contractors should, whenever economically feasible, make reasonable efforts to use Union signatory vendors, which includes, but not limited to, UA Yellow Label and SMW Blue Label products for off-site assemblies or fabrications.

D. This Section does not refer to construction material normally purchased pre-assembled or manufactured, it references Project Work normally and historically done on-site or in Local Union fabrications shops.

E. If any dispute should arise with respect to this Section, the Contractors agree to install any off-site assemblies or fabricated items regardless of the source. The parties shall endeavor to settle such dispute in the Labor Management forum or appropriate sub-committee before a grievance is filed under Article 9.

ARTICLE 6 — MANAGEMENT RIGHTS

SECTION 6.1 RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to: the right to direct the Project Work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; or the discipline or discharge for just cause of its employees; the assignment and schedule of Project Work; the promulgation of reasonable Project Work rules; and the requirement, timing and number of employees to be utilized for overtime Project Work. Nothing contained herein shall be construed so as to allow direction of an Employee to perform Project Work outside the jurisdiction of that Employee's Labor Union affiliation, if any. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual (as determined by the Contractor) and/or joint working efforts with other employees shall be permitted or observed.

SECTION 6.2 MATERIALS, METHODS & EQUIPMENT

A. There shall be no limitation or restriction upon the Owner's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre- finished, or pre-assembled materials, tools, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source, subject to the requirements of Section 6.2(B). The on-site installation or application of such items shall be performed by the craft having jurisdiction over such Project Work pursuant to an applicable collective bargaining agreement; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor.

B. All parties to this Agreement acknowledge that funding for this Project includes but is not limited to funds from the American Rescue Plan Act ("ARPA") State and Local Fiscal Recovery Funds ("SLFRF"), which are also governed by the "Uniform Guidance" requirements in 2 C.F.R. Part 200 and funds from the New York State Energy Research and Development Authority ("NYSERDA"). As a condition of contract, Project Contractors will be required to comply with all procurement requirements pertaining to such funding, including but not limited to Buy American requirements and Recovered/Recycled Product Content requirements.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 7.1 NO STRIKES-NO LOCK OUT

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, demonstrations or other disruptive activity on Project Work site for any reason by any signatory to this Agreement. There shall be no Union or concerted or employee activity which disrupts or interferes with the Project Work. Should any employee breach this provision, the Local Unions will use their best efforts to immediately end the breach and return all employees to work. There shall be no lockout by any signatory to this Agreement.

SECTION 7.2 DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 7.1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 working days.

SECTION 7.3 NOTIFICATION

If a Contractor contends that any Union has violated this Article, it shall notify the Council of such fact, with copies of the notification to the Local Union involved. The Council and Local Union shall instruct, order, and otherwise use their best efforts to cause the employee(s) to

immediately cease and desist from any violation of this Article. The Council shall not be liable for the unauthorized acts of a Local Union or its members. Similarly, a Local Union and its members shall not be liable for any unauthorized acts of its members, the Council, or another Local Union.

SECTION 7.4 EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 7.1 of this Article or Section 8.3(D)(ii) of Article 8 may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

A. A party invoking this procedure shall notify J.J. Pierson, Neal M. Eiseman and Thomas Hines, in this order, who shall alternate as Arbitrator under this expedited arbitration procedure. If the Arbitrator next on the list is not available to hear the matter within 24 hours of notice, the next Arbitrator on the list shall be called. Copies of such notification will be simultaneously sent to all parties (the alleged violator, the Council, the Local Union, the Contractor, and the Owner).

B. The Arbitrator shall hold a hearing within 48 hours of receiving the notice invoking the procedure if it is contended that the violation still exists. The Arbitrator shall provide at least 24 hours' notice (excluding Sundays and holidays) to all parties as to time and place of the hearing.

C. All notices pursuant to this Article must be delivered to all parties (Local Union, Council, Contractor, alleged violator, and Owner) and may be provided by telephone, telegraph, hand delivery, fax, email, or confirmed overnight delivery. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case and conduct their cross examination) unless otherwise agreed. A failure of any party to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. (i) Section 7.1 hearings:
The sole issue at the hearing shall be whether a violation of Section 7.1 occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease-and-Desist Award restraining such violation and serve copies on all parties. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (any damages issue is reserved solely for court proceedings, if any). The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

(ii) Section 8.3(D)(ii) hearings:

The sole issue at the hearing shall be whether a violation of Section 8.3(D)(ii) occurred. If a violation is found to have occurred, it shall be prima facie evidence of intentional mis-assignment, and the Arbitrator shall issue an immediate stop-work order with respect to the Project Work involved and reassign the Project Work as necessary. The Arbitrator is also authorized to (a) award damages or back pay in order to make the aggrieved trade whole, and (b) remove the offending Contractor from the job in egregious situations.

E. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to all parties. In any court proceeding to obtain a temporary or preliminary order enforcing the Arbitrator's Award as issued under this expedited procedure, the involved Union and Contractor waive their right to a hearing and agree that such proceeding may be commenced by order to show cause. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

F Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

G The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union. There shall be chargeback or cost to the county/owner.

SECTION 7.5 ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 7.1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 7.1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 — LABOR MANAGEMENT COMMITTEE

SECTION 8.1 SUBJECTS

The Project Labor Management Committee ("Committee") will meet as established by the Committee to: 1) promote harmonious relations among the Contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interest; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; 5) review Affirmative Action and equal employment opportunity matters pertaining to the Project, if any and increase work opportunity within the County for County

residents.

SECTION 8.2 COMPOSITION

The Committee shall be jointly chaired by a designee of the Owner and the Council. It may include representatives of the Local Unions and Contractors involved in the issues being discussed. The Committee may conduct business through mutually agreed upon sub-committees.

SECTION 8.3 PRE-JOB CONFERENCE

A. So that the start and continuation of Project Work may progress without interruption, the Committee shall require each Contractor and Subcontractor of whatever tier to conduct a pre-job conference with the Council prior to commencing work. The Construction Manager or General Contractor shall be advised in advance of such conferences and may participate if they wish. This pre-job conference with the Council is in addition to any pre-job/pre-construction conferences required by the Project Contract Documents.

B. The purpose of the pre-job conference with the Council shall be for the parties to gain an understanding of each Contractor's proposed work assignments, the standard work day and work week, the number of employees to be employed, the method of referral, the applicable wage rates and fringe benefit contributions and any other matters in accordance with this Agreement.

C Proposed Trade Assignments. In conjunction with the pre-job conference with the Council required by this Section, each Contractor shall fill out the attached Schedule E — Proposed Trade Assignments identifying all Subcontractors and indicating what trades will be used to perform the Project Work. This form shall be submitted to the Council at least thirty (30) days in advance of the commencement of Project Work. If any Local Union(s) objects to or disagrees with the Proposed Trade Assignment of either the Contractor or Subcontractor, the Local Union will state its objection within three (3) days of the submission of the Proposed Trade Assignments and there shall be a good faith discussion among the Contractor or Subcontractor and the objecting Local Union and other affected Unions to resolve the matter. If no resolution is reached, any involved Local Union may submit their objection position in writing, together with support documentation, within seven (7) calendar days of the submission of the Proposed Trade Assignments to the Contractor or Subcontractor with a copy to all affected Local Unions. Failure of any objecting Local Union and/or other affected Unions to timely object or submit such objection positions in writing waives any objection to the Proposed Trade Assignments. The Contractor or Subcontractor will review all submitted supporting documentation regarding the Proposed Trade Assignments and will submit to the Construction Manager, the Council, and all affected Local Unions a "Final Trade Assignment" letter within fourteen (14) days calendar days of

the pre-job meeting at which the Proposed Trade Assignments were made.

D. Disputes and Violations.

(1) Unresolved disputes concerning trade assignments shall be handled in accordance with Section 10.1, 10.2, and 10.3 of Article 10 in accordance with the National Plan for Settlement of Jurisdictional Dispute in the Construction Industry established by the Building and Construction Trades Department, incorporated by reference in Schedule D, provided however, that disputes concerning intra-trade assignments (assignments between trades within the same International Union) will be determined by the applicable International Union.

(2) Contractor's failure to conduct a pre-job conference with the Council, failure to include all required parties in a pre-job conference with the Council, or failure to adhere to agreed-upon Schedule E trade assignments is a violation of this Agreement and prima facie evidence of intentional mis-assignment. Alleged violations of this provision shall be considered a lock-out and subject to the expedited arbitration procedures of Article 7, Section 7.4.

(3) All remaining unresolved issues shall be subject to the provisions of Article 9.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 9.1 CLOSE COOPERATION

The Contractors, Unions, and employees, collectively and individually, realize the importance to all parties to maintain continuous and uninterrupted performance of Project Work and agree to resolve disputes in accordance with the grievance-arbitration provisions set forth in this Article.

SECTION 9.2 PROCEDURE

Any question, dispute or claim arising during the term of this Agreement involving the interpretation or application of this Agreement (other than jurisdictional disputes and alleged violations of Section 7.1, and Section 8.3(D)(2)), shall be considered a grievance and shall be resolved pursuant to the following procedure.

Step 1:

A. When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall give notice of the claimed violation to the Local Union representative or job steward, who shall notify the Project Work site representative of the involved Contractor and the Construction Manager. To be

timely, such notice must be in writing given within 7 calendar days after the act, occurrence or event giving rise to the grievance. Strict compliance with this 7-day notice is a condition precedent to proceeding with such grievance. The Local Union representative or the job steward shall meet with the Project Work site representative of the involved Contractor and the Construction Manager and endeavor to adjust the matter within 7 calendar days after timely notice has been given. The representative of the involved Contractor shall keep the minutes of the meeting and shall respond to the Union representative in writing, with copy to the Construction Manager, within twenty-four (24) hours after the conclusion of the meeting. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved, unless the settlement is accepted in writing by the Labor-Management Committee as creating a precedent with respect to Project Work.

B. Should any signatory to this Agreement have a dispute [excepting jurisdictional disputes and alleged violations of Section 7.1 or Section 8.3(D)(i) or (ii) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute may be reduced to writing and the grieving party may proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

Upon timely receiving a written grievance, the involved Contractor shall notify and schedule a meeting with the Business Manager of the involved Local Union, the Council, and the Construction Manager, and their respective representatives, for the purpose of arriving at a satisfactory settlement. Such meeting shall be held within 7 calendar days of the involved Contractor's receipt of the written grievance. Meeting minutes shall be kept by the Contractor with copies to the parties within twenty-four (24) hours.

Step 3:

A. If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants, including the Construction Manager) along with copies of the minutes from Step 1 and Step 2, to the acting Arbitrator under this procedure (alternating between J.J. Pierson, Roger Moyer and Thomas Hines). The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which

all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union, and employees, and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

B. Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Construction Manager, the involved Contractor, and the involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 10.1 ASSIGNMENT

The assignment of Project Work shall be solely the responsibility of the Contractor performing the Project Work involved, subject to the pre-job conference with the Council and the procedures set forth in Section 8.3(C), and such Project Work assignments shall be in accordance with the National Plan for the Settlement of Jurisdictional Disputes in the Construction Industry ("National Plan"), incorporated by reference into Schedule D, or any successor Plan approved by the Building & Construction Trades Department, AFL-CIO.

SECTION 10.2 PROCEDURE FOR SETTLEMENT OF JURISDICTIONAL DISPUTES

All jurisdictional disputes involving Project Work shall be settled according to the National Plan, provided however, that disputes concerning intra-trade assignments (assignments between trades within the same International Union) will be determined by the applicable International Union.

SECTION 10.3 NO DISRUPTIONS

There will be no strikes, work stoppages, or slowdowns, arising out of any jurisdictional dispute. Pending the resolution of the dispute, the Project Work shall continue uninterrupted and as assigned by each Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 10.4 AWARD

Any jurisdictional award pursuant to this Article shall be final and binding on the disputing Unions and the involved Contractor on this Project only and may be enforced in any court of competent jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement.

SECTION 10.5. LIMITATIONS

Awards made under this Article shall determine only to whom the disputed Project Work belongs. The deciding person or group hereunder shall have no authority to (a) assign Project Work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the Project Work involved; (b) assign work to employees who are not qualified to perform the work involved; or (c) assign Project Work being performed by non-Union employees to Union employees. This provision does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than (1) employee is needed for the job.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 11.1 CLASSIFICATION AND HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the wage rates applicable for those classifications as required by the Schedule A applicable to the work. The term "straight time" in this Agreement shall mean the hourly wage rate applicable for those classifications as required by the applicable New York State Labor Law Section 220 ("Section 220") prevailing wage determination.

SECTION 11.2 EMPLOYEE BENEFITS

A. Unless expressly provided differently in this Agreement, Contractors agree to pay employee benefits/supplements on behalf of all of their employees covered by this Agreement in the amounts required by the applicable Section 220 schedule in effect. Except as provided herein, the Contractors agree that such payments shall be made to those established jointly trusteed employee benefit funds designated in the applicable Schedule A agreement, and in the amounts so designated, to the extent such payments are required by and satisfy the Section 220 obligation. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if they similarly fall within Section 220. Contractors not otherwise contractually bound to do so, shall not be required to contribute to non-Section 220 benefits, trusts or plans; however, this provision does not relieve Contractors which are signatory to local collective bargaining agreements with any Local Union from complying with the benefit requirements for all funds contained in those collective bargaining agreements.

B Notwithstanding Section 11.2(A):

(1) Contractors who designate employees pursuant to Article 4, Section 4.2(B), may satisfy the above benefits obligation with respect to those employees by: (1) providing those employees with coverage under their private benefit plans for health, welfare, pension, annuity and 401(k); or (2) paying the full

amount of such benefit to the employee in employees' wages. The total benefit payments to be made on behalf of each such employee must equalthe total Section 220 benefit/supplement amount. If the Contractor's contribution into the private benefit plan for the above funds is less than the amount required by Section 220, the difference must be paid to the employee in cash. Payments of other benefits covered under Section 220 shall be paid to the respective Unions on behalf of each employee.

(2) This same option shall apply with respect to any other employee who is referred to the Contractor through the hiring hall process provided such employee was previously employed by the Contractor and was a participant in a bona fide private benefit plan maintained by the Contractor which satisfies the requirements of Section 220.

(3) The option for a private plan equivalent supplement shall not apply to contributions into Joint Apprentice Training Committee (JATC), or similar apprentice funds designated in the applicable Schedule A agreement, if the Contractor does not have an apprentice training program approved by the Department of Labor (However, all Contractors with contracts for this Project in excess of $500,000 must participate in apprenticeship training programs pursuant to New York State Labor Law §222(2)(e)). Upon request by the Council, any Contractor providing coverage under this provision will provide the Council with documentation of benefit payments made to individual employees during the term of their employment on the Project.

(4) Contractors who exercise the option under Section 11.2(B) of this Article to pay into their own private benefit plans rather than the applicable jointly trusteed funds designated in the applicable Schedule A agreement shall be responsible for and guarantee employee benefit/supplement payments and shall indemnify and hold harmless the jointly trusteed funds designated in the applicable Schedule A agreement against any and all benefit/supplement claims by its employees.

C Contractors who contribute to jointly trusteed funds under this Section agree to be bound by the written terms of the legally-established jointly trusteed Trust agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such trust funds but only with regard to Project Work done and only for those employees for whom this Agreement requires such benefit payments. Notwithstanding the foregoing, a Contractor's liability shall be at all times limited to the amount of contributions required to be made to the Trust Funds.

D. Each Contractor shall be responsible for and guarantee the payment of all required fringe benefits on the Project. The Local Unions and/or the Council

shall notify the Construction Manager within 120 hours excluding weekends whenever a Contractor or Subcontractor fails to make a required benefit payment and such delinquency remains outstanding after 30 days. Notification must be in writing and may be by email. If written notice of such a delinquency is received by the Construction Manager within that 120-hour period it shall withhold from any funds due to the delinquent Contractor the amount of that delinquency, up to the total amount due, until any dispute regarding the delinquency has been resolved. The Construction Manager shall have no other obligation with respect to contributions owed by any Contractor (or its Subcontractor); but that each Contractor shall continue to be obligated with respect to contributions based on Project Work done by that respective Contractor. If notice of a delinquency is not received by the Construction Manager within the required time periods, Owner shall have no basis upon which to withhold, with respect to that delinquency, any part of a payment which is otherwise due. Construction Manager shall require Contractors to submit proof of benefit payment with pay request.

ARTICLE 12 — HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 12.1 WORK WEEK AND WORK DAY

C. Unless otherwise provided for in this Agreement, the standard work week shall be five days, Monday through Friday, eight hours per day plus k2 hour unpaid lunch period each day. The starting time for the standard work week shall start at either 6:00 a.m., 6:30 a.m., 7:00 a.m., 7:30 a.m. or 8:00 a.m. Multiple starting times shall be allowed.

B. Four-tens: notwithstanding any other provision of the Agreement, when working a four-day work week, the work shall consist of 4 days, Monday through Thursday, ten hours per day plus 1/2-hour unpaid lunch period at the straight time rate. The starting time for four-tens shall be 6:00 a.m. 6:30 a.m. 7:00 a.m. A three-day minimal notice shall be required for four-tens to the respective involved Unions.

C. On a 5-day work week, Saturday may be used as a make-up day at straight time to fulfill the 40-hour work week date to inclement weather. On a 4-day work week, Friday may be used as a make-up day at straight time to fulfill the 40-hour work week. Make-up days shall be scheduled for a minimum of 8 hours, except in the case of inclement weather in which Section 12.5 shall apply. This minimum shall also apply when more than one shift or multiple shifts are worked.

D. The changing of the regular starting time, except in the case of overtime and the switch from a 5- day and 4-day work weeks shall be a 4-week minimum.

SECTION 12.2 OVERTIME

Overtime pay for hours outside of the standard work week and work day, defined in Section 12.1, and all work on Saturdays shall be paid at time and one half the hourly rate and benefits will be paid on straight time. All work on Sundays shall be paid at two times the hourly rate and benefits will be paid at straight time.

SECTION 12.3 SHIFTS

A. Flexible Schedules — Scheduling of shift work, including Saturday and Sunday work, shall be within the discretion of the Contractor in order to meet Project Work schedules and existing Project Work conditions. Shifts must have prior approval of the Construction Manager and Owner and must be scheduled with not less than three work days' notice to the Local Union.

B. Second and/or Third Shifts — Saturday and/or Sunday Work.

The second shift shall start between 3 p.m. and 6 p.m. and the third shift shall start between 11 p.m. and 2 a.m. Shift differentials shall be straight time plus fifty percent (50%) of the applicable Schedule A agreement shift differential. No other premium or payments for such work shall be required unless such work is in excess of 40 hours during the week. There shall be no reduction in hours worked on a second and/or third shift, except that when 3 shifts are working together, the length of one or more shifts can be reduced to accommodate a 24-hour day and only actual hours worked will be paid. Work performed on Saturdays or Sundays shall be paid as provided in the applicable Schedule A agreement.

C. To clarify above, Schedule A Shift Differential designated percentage rates vary according to each trade's prevailing Collective Bargaining Agreement. Shift work as part of this Project Labor Agreement is 50% of the designated percentage of the shift percentages of each trade, for example if a trade's shift differential is 15% it would be 7.5%.

SECTION 12.4 HOLIDAYS

A. Schedule - There shall be seven (7) recognized holidays:

New Year's Day
President's Day
Memorial Day
Fourth of July
Labor Day
Thanksgiving Day
Christmas Day

All said holidays shall be observed on the dates designated by New York State Law. In the absence of such designation, they shall be observed on the calendar date, except that holidays which occur on Sunday shall be observed on the following Monday and holidays which occur on a Saturday shall be observed on the previous Friday.

B. Payment - Regular holiday pay, if any, for work performed on a recognized holiday shall be in accordance with the applicable Schedule A agreement. There will be no benefits paid on holidays unless worked.

C. Exclusivity - No holidays other than those listed in Section 12.4 shall be recognized or observed in relation to holiday pay and benefits.

SECTION 12.5 REPORTING PAY

A. When on a five-day work week, employees who report to the work location pursuant to a regular schedule and who are not provided with work for whatever reason, shall receive two (2) hours reporting pay, four (4) hours if work starts and (8) hours pay if work occurs after the 4th hour except in the case of inclement weather in which hours worked after the four hours shall be paid and when on a four-day work week with a 10-hour day, (3), (5) and (10) shall apply as per the same terms above.

B. When an employee who has completed his or her scheduled shift and has left the Project site is "called out" to perform special work of a casual, incidental, or irregular nature, the employee shall receive pay for actual hours worked at applicable straight time or overtime rates in accordance with this Agreement, but no less than a minimum guarantee of two (2) hours at the employee's straight time rate.

C. When an employee leaves the job or work location of their own volition, is discharged for cause, or is not working as a result of the Contractor's invocation of Section 12.8 below, he or she shall be paid only for the actual time worked.

D. There shall be no pay for time not actually worked except as specifically set forth in this Article 12 and where an applicable Schedule A agreement applies to Forepersons, Stewards and Lead Engineer in reference to pay.

SECTION 12.6 PAYMENT OF WAGES

A. Payday: Payment shall be made by check, drawn on a New York bank with branches located within commuting distance of the job site. Paychecks shall be issued by the Contractor at the job site by 3:00 p.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than one week's wages shall be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination: Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of layoff ordischarge.

SECTION 12.7 INJURY/DISABILITY

An employee who, after commencing Project Work, suffers a work-related injury or disability while performing Project Work duties, shall receive no less than eight (8) hours wages for that day. Further, the employee shall be rehired at such time as the employee is able to return to duties provided there is still Project Work available for which the employee is qualified and able to perform.

SECTION 12.8 EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life, property, and/or safety of employees or others, suspend all or a portion of Project Work. In such instances, employees shall be paid for actual time worked; provided however, that when a Contractor requests that employees remain at the job site available for Project Work, employees shall be paid for "stand-by" time at their hourly rate of pay.

ARTICLE 13 - APPRENTICESHIP & HELMETS TO HARDHATS

SECTION 13.1 APPRENTICE RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women, and economically-disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such Project Work as is within their capabilities and that is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A agreement in a ratio of not less than twenty-five percent (25%) of the work force by craft (without regard to whether a lesser ratio is set forth in the applicable Schedule A agreement), unless the applicable Schedule A agreement provides for a higher percentage. The first person assigned to the job shall be a Journeyman. The second person assigned may be an apprentice. Subsequent assignments shall be Journeymen until the applicable ratio is achieved. This assignment shall be repeated until staffing needs are satisfied. Apprentices and such other classifications as are appropriate will be employed in a manner consistent with the provisions of the applicable Schedule A agreement.

SECTION 13.2 NYS DEPARTMENT OF LABOR- APPRENTICESHIP

To assist the Contractors in attaining a maximum effort on this Project, the Unions agree to work in close cooperation with, and accept monitoring by, the New York State Department of

Labor to ensure that minorities and women are afforded every opportunity to participate in apprenticeship programs that result in the placement of apprentices on this Project.

SECTION 13.3 WICKS LAW

Pursuant to General municipal law §101(5) a contract letting agency (Ulster County) can use the Wicks Law exemption on this project as an option. This would allow for a single prime or general contractor which would include all mechanical, electrical, and plumbing under one contract. This would be at the discretion of the County and the Construction Manager and not Union.

SECTION 13.4 Ulster County Law No. 5 of 2023

Attached as Appendix 1.

SECTION 13.5 NEW YORK HELMETS TO HARDHATS

The Contractors and the Unions desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and the Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (the "Center") and the Center's "New York Helmets to Hardhats" program as a resource for preliminary orientation and assessment of construction aptitude; referral to apprenticeship programs or hiring halls; counseling and mentoring; and support networks, employment opportunities, and other needs as identified by the parties.

The Unions and the Contractors agree to work with the Center to create and maintain an integrated database of veterans interested in working on the Project as well as information about apprenticeship and employment opportunities related to this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

SECTION 13.6 PARTICIPATION GOALS (MBE, WBE, SDVOB, DBE, LABOR SURPLUS AREA)

A. The County, Construction Manager, Contractors, the Hudson Valley Building and Construction Trades Council and its affiliated Unions are committed to meeting federal and New York State Participation Goals, if any are applicable to the Project, and shall be in alignment with the current goals or standards set for by federal or New York State requirements for Minority Business Enterprises (MBE), Woman Owned Business Enterprise (WBE), Service-Disabled Veteran Owned Business (SVDOB), Disadvantaged Business Enterprises (DBE), and federal Labor Surplus Area requirements, to ensure participation on the project by MBE, WBE

and SVDOB firms and job-seekers from federal Labor Surplus Areas while maintaining fiscal responsibility.

B. Outreach by the Construction Manager, Contractors, Hudson Valley Building and Construction Trades and affiliated Unions and contractor associations to ensure participation goals of NYS Certified MBE, WBE and SDVOB firms and Labor Surplus Area recruitment are met will be required through the project,

ARTICLE 14 — NO DISCRIMINATION

SECTION 14.1 COOPERATIVE EFFORTS

The Contractors and Unions agree that they shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, marital status, age, Union or non-Union status, real or perceived sexual orientation or any other status protected by law, in any manner prohibited by law or regulation. It is recognized that special procedures may be established by Contractors and Local Unions and the New York State Department of Labor for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement shall assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project. Nothing in this section shall be grieveable.

SECTION 14.2 LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including all genders.

ARTICLE 15— GENERAL TERMS SECTION

SECTION 15.1 PROJECT RULES

A. The Construction Manager and Contractors may establish from time to time such reasonable Project rules as are necessary for the good order of the Project. These rules shall be outlined at the pre-job conference with the Council, detailed in the contract documents, posted at the Project site, and may be amended thereafter as necessary.

B. Security Protocols — The Construction Manager with Owner's approval and in their sole discretion, will determine security protocols for the entire Project Site. Strict

compliance by all Contractors and subcontractors of all tiers and their respective personnel with security procedures, protocols, and directives issued by these entities or its delegated, is required at all times.

SECTION 15.2 TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the Project Work performed. Employees using these tools shall perform any of the Project Work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of Project Work within the employee's jurisdiction.

SECTION 15.3 SUPERVISION

Employees or other personnel shall work under the supervision of the craft foreperson or general foreperson for the applicable hiring or subcontracting Contractor.

SECTION 15.4 FULL WORKDAY

A. Employees shall be at their Project Work area at the starting time established by the Contractor.

B. The signatories to this Agreement reaffirm their policy of a fair day's work for a fair day's wage.

ARTICLE 16 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 16.1 SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA and New York State mandated safety requirements are at all times maintained on the Project and the employees and Unions agree to cooperate fully with these efforts. Employees must perform their Project Work at all times in a safe manner and protect themselves and the property of the Contractor from injury or harm. Failure to do so may be grounds for discipline, including discharge. Prevention of accidents at the site is the responsibility of the Contractors, its employees, subcontractors and suppliers, persons, and entities at the Project Site. The Contractors shall establish their own safety programs implementing safety measures, policies, and standards conforming to those required or recommended by governmental and quasi-governmental authorities having jurisdiction. The Construction Manager is not responsible for identifying unsafe practices, nor for failure to stop the Contractors' unsafe practices; and the Construction Manager's failure to stop the Contractors' unsafe practices shall not relieve the Contractors of the responsibility thereof.

SECTION 16.2 CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Owner. Such rules will be referenced in the Contract Documents and may be distributed to Contractors for further distribution to personnel and/or posted in conspicuous places throughout the Project.

SECTION 16.3 INSPECTIONS

The Contractors, Owner, Architect/Engineer, and Construction Manager retain the right to inspect incoming shipments of equipment, apparatus, machinery, and construction materials of every kind.

ARTICLE 17 — TEMPORARY SERVICES

Temporary light, power, cooling, ventilation and other services shall only be required on the specific request of a Contractor and when requested shall be assigned in accordance with the Contract Documents. Temporary coverage may be provided by the supplying Contractor's employees already working under this Agreement during regular work hours. The supplying Contractor will determine the need for temporary coverage requirements during non-work hours. For safety reasons, temporary light and power panels will only be accessed by employees of the Contractor responsible for supplying the temporary light and power panels. Coverage requirements shall not require a standby employee who is not performing Project Work. There shall be no stacking of trades on temporary services. In the event temporary services are claimed by multiple trades, the matter shall be resolved pursuant to Article 10.

ARTICLE 18 - SAVINGS AND SEPARABILITY

SECTION 18.1 THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, the provision involved (and/or its application to a particular part of the Project, as necessary) shall be rendered, temporarily or permanently, null and void, but the remainder of the Agreement shall remain in full force and effect to the extent allowed by law. In the event a court of competent jurisdiction finds any portion of the Agreement to be invalid, the parties will immediately enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the court determination and the intent of the parties hereto for contracts to be let in the future.

SECTION 18.2 NON-WAIVER

Nothing in this Agreement is intended to be or shall be construed as a waiver by any Union(s) of any prevailing wage determination or schedule that is applicable to their trade for any public work that has been or may be performed in the future on any work outside the scope of this Agreement. Nothing contained in this Agreement is intended to be or shall be construed as a waiver

by any Union(s) of any more favorable term or condition of employment that may be contained in any collective bargaining agreement applicable to work outside the scope of this Agreement.

ARTICLE 19 - FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS

SECTION 19.1 CHANGES TO AREA CONTRACTS

Each Schedule A agreement incorporated by reference into this Agreement by Schedule A shall continue in full force and effect until the Contractor and/or Union parties to the area collective bargaining agreements which are the basis for the applicable Schedule A agreement, notify the Owner and Constriction Manager in writing of the agreed upon changes in the Schedule A agreement which is applicable to the Project, and their effective dates. Such changes shall only be effective to the extent consistent with this Agreement. Any disagreement between signatories to this Agreement over the incorporation into Schedule A of provisions agreed upon in the renegotiation of area collective bargaining agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 19.2 LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there shall be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiation of area local collective bargaining agreements, nor shall there be any lock-out on this Project affecting a Local Union during the course of such renegotiations.

ARTICLE 20 — PROJECT SPECIFIC

SECTION 20.1 WORKERS COMPENSATION ADR

At the written option of the Contractor and with the written approval of the Building and Construction Trades Council of Westchester and Putnam Counties New York, all Local Unions, Contractors and subcontractors working on this Project agree to be bound by the Collectively Bargained Workers Compensation Alternative Dispute Resolution Agreement (ADR Agreement), and to the ADR program set forth therein, by and between the Construction Industry Council of Westchester and the Hudson Valley, Inc., and the Building and Construction Trades Council of Westchester and Putnam County, New York, on file with and approved by the New York State Workers Compensation Board February 17, 2022 as amended.

SECTION 20.2 HUDSON VALLEY BUILDING AND CONSTRUCTION TRADES LABOR MANAGEMENT ALLIANCE

If not prohibited by law and there are no direct or additional costs to the parties to this Agreement, the parties agree to participate in the Hudson Valley Building and Construction Trades Labor Management Alliance. The contribution rate will be .06 per hour borne equally between the employee and employer. Contributions will be submitted monthly.

SECTION 20.3 CLEAN UP

A clean work site results in a safe and more productive job site. All cleanup during construction shall be performed by the trades having jurisdiction for cleanup in accordance with the Project Contract Documents. The Owner will ensure a clean and safe workplace. The Owner or Construction Manager may back charge Contractors accordingly if clean up becomes unsatisfactory.

Once construction is complete and a building, section or floor is turned over to a professional cleaning company for final cleaning, including but not limited to, windows and floor prep, up to 33.3% of the Employees may be a direct employee of the cleaning company. Those direct employees shall be exempt from this Agreement.

SECTION 20.4 FURNITURE, FIXTURES AND EQUIPMENT (FFE)

Except for furniture, fixtures and equipment specifically in Schedule G. Project Work related to furniture, fixtures and equipment that is free standing and requires no onsite assembly and is not fastened, mounted or anchored to any part of the building structure

by glue, screws, nails, mechanical fastener or by other means is excluded from this Agreement. Accordingly, for the avoidance of doubt, all unloading, handling, assembly, installation and cleanup of all furniture, fixtures and equipment which requires fastening, mounting or anchoring to any part of the building structure by glue, nails, screws, mechanical fasteners or by other means, or requires any onsite assembly, shall be included Project Work under this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the 1st day of June 2024.

FOR THE HUDSON VALLEY BUILDING AND
CONSTRUCTION TRADES COUNCIL:

By: _____
L. Todd Diorio, President

FOR CONSTRUCTION MANAGER: The Palombo Group

BY: _____
(Name/Title)

For Local Unions:

International Union of Bricklayers and Allied Craftworkers Local NO. 1

Signed: [signature] Title: Field Rep

Email: mckfield@bac1ny.com Phone: 8455224561

International Brotherhood of Boilermakers, Iron Ships Builders, Blacksmiths, Forgers & Helpers District NO. 5

Signed: Thomas F. Ryan Title: BM-ST

Email: Boilermakers Local5@verizon.net Phone: 516-326-2500

Bricklayers and Allied Crafts, Tile, Marble & Terrazzo Union of New York & New Jersey Local NO. 7

Signed: [signature] Title: Field Rep

Email: svirga@baclocal7.com Phone: 917 734 7429

United Union of Roofers, Waterproofers and Allied Workers Local NO. 8

Signed: [signature] Title: BA

Email: Phone: 646 294 1510

District Council NO. 9, International Union of Painters and Allied Trades, A.F.L-C.I.O.

Signed: [signature] Title: BD

Email: SPezDog@aol.com Phone: 914 260 1807

Laborers International Union of N.A. Local 17

Signed: _____ Title: BUSINESS MANAGER

Email: DIORIO J@HOTMAIL Phone: 914-424-6220

International Association of ~~Sheet Metal, Air, Rail and Transportation Workers (SMART)~~ Heat & Frost Local NO. 38 40

Signed: _____ Title: Manager

Email: Phone:

International Association of HBAT and Frost Insulators and Allied Workers Local NO. 91

Signed: _____ Title: NA

Email: Phone:

International Union of Elevators (IUEC) Local NO. 138

Signed: _____ Title: _____

Email: Phone:

O.PC.M.I.A. Plasters Union Local NO. 262

Signed: _____ Title: Business Manager

Email: Palleyne@local262.org Phone: (914)-255-8601

North Atlantic States Regional Council of Carpenters Local NO. 279 | 1163

Signed: _____ Title: Business Manager

Email: SSmith@nasrcc.org Phone: 845-263-7516

International Brotherhood of Electrical Workers Local NO. 363

Signed: Sam Fratto Title: Business Manager

Email: SFratto@IBEWLU363.org Phone 845-216-7023

Plumbers, Steamfitters & Service Technicians Local NO. ~~373~~ 21

Signed: Thomas O'Brien Title: BM

Email: TobrienA@local21union.com Phone 914-447-0952

International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Local NO. 417

Signed: Matthew P. Stoddard Title: BUSINESS Manager

Email: matts417@verizon.net Phone (845) 629-1185

International Brotherhood of Teamsters Local Union NO. 445

Signed: [illegible] Title: Business Agent

Email: jcline nov@teamstersunionlocal445.org Phone: 845-394-4763

Road Springler Fitters Union Local NO. 669

Signed: Kenneth W. Killey Title: Business Agent

Email: Killey669@gmail.com Phone: 914-475-9100

United Cement Masons Local NO. 780

Signed: P. D'Onofrio Title: Business Agent

Email: PDANGelo@NOCBC.org Phone: 917-578-7465

International Union of Operating Engineers Local NO. 825

Signed: Michael J. Hamm Title: BUSINESS REP

Email: Phone:

Int'l Assoc Sheet Metal Workers Workers, Transportation Workers Local 38

James Nester Business Agent

Unionoffice@smart38.org 203-994-0394

For Local Unions:

International Union of Bricklayers and Allied Craftworkers Local NO. 1

Signed: [signature] Title: Field Rep

Email: mclifford@bac1ny.com Phone: 8455224561

International Brotherhood of Boilermakers, Iron Ships Builders, Blacksmiths, Forgers & Helpers District NO. 5

Signed: Thomas F. Ryan Title: BM-ST

Email: BoilermakersLocal5@verizon.net Phone: (516) 326-2500

Bricklayers and Allied Crafts, Tile, Marble & Terrazzo Union of New York & New Jersey Local NO. 7

Signed: [signature] Title: Field Rep

Email: SUIRGA@BACLOCAL7.com Phone: 917-734-7429

United Union of Roofers, Waterproofers and Allied Workers Local NO. 8

Signed: [signature] Title: BA

Email: Phone: 646 294 1510

District Council NO. 9, International Union of Painters and Allied Trades, A.F.L-C.I.O.

Signed: [signature] Title: BO

Email: Slezdc9@Aol.com Phone: 914 260 1807

Laborers International Union of N.A. Local 17

Signed: _____ Title: BUSINESS MANAGER

Email: DIORIO J@HOTMAIL Phone: 914-424-6220

International Association of ~~Sheet Metal, Air, Rail and Transportation Workers (SMART)~~ Heat and Frost Local NO. ~~38~~ 40

Signed: _____ Title: Manager

Email: Phone:

International Association of HBAT and Frost Insulators and Allied Workers Local NO. 91

Signed: _____ Title: NA

Email: Phone:

International Union of Elevators (IUEC) Local NO. 138

Signed: _____ Title: _____

Email: Phone:

O.PC.M.I.A. Plasters Union Local NO. 262

Signed: _____ Title: Business Manager

Email: Palleyne@local262.org Phone: (914)-255-8601

North Atlantic States Regional Council of Carpenters Local NO. 279

Signed: _____ Title: Business Manager

Email: SSmith@nasrcc.org Phone: 845-263-7516

International Brotherhood of Electrical Workers Local NO. 363

Signed: Sam Frutto Title: Business Manager

Email: SFrutto@IBEWLU363.org Phone 845-216-7023

Plumbers, Steamfitters & Service Technicians Local NO. ~~373~~ 21

Signed: [signature] Title: BM

Email: Tobrien@local21union.com Phone 914-447-0952

International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Local NO. 417

Signed: [signature] Title: B.M.

Email: matts417@verizon.net Phone 845 629-1185

International Brotherhood of Teamsters Local Union NO. 445

Signed: [signature] Title: Business Agent

Email: jclairemont@teamsterslocalunion445.org Phone: 845-394-4763

Road Springler Fitters Union Local NO. 669

Signed: [signature] Title: Business Agent

Email: Klilley669@gmail.com Phone: 914-475-9158

United Cement Masons Local NO. 780

Signed: P. D'Angelo Title: Business Agent

Email: PDANGelo@NOEDC.ORG Phone: 917-578-7465

International Union of Operating Engineers Local NO. 825

Signed: Michael Hamm Title: BUSINESS REP

Email: Phone:

Association Sheet Metal Air, Rail Transportation Workers Local 38

James Nestor Business Agent

Unionoffice@smart38.org 203-994-0394

SCHEDULE A — LOCAL COLLECTIVE BARGAINING AGREEMENTS

ARTICLES OF AGREEMENT between the INTERNATIONAL BROTHERHOOD OF BOILERMAKERS, IRON SHIP BUILDERS, BLACKSMITHS, FORGERS & HELPERS, AFL-CIO and THE FIRMS WHOSE SIGNATURES ARE AFFIXED HERETO

AGREEMENT by and between THE CONSTRUCTION CONTRACTORS' ASSOCIATION OF THE HUDSON VALLEY, BUILDING CONTRACTORS ASSOCIATION, AND THE MASON AND CONCRETE CONTRACTORS ASSOCIATION OF THE HUDSON VALLEY and THE INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS LOCAL 1 NEW YORK

AGREEMENT between THE ASSOCIATIONS and the NORTH ATLANTIC STATE REGIONAL COUNCIL OF CARPENTERS LOCAL UNION 279

AGREEMENT by and between the HUDSON VALLEY CHAPTER, NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION and LOCAL UNION 363, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

AGREEMENT by and between the NATIONAL ELEVATOR BARGAINING ASSOCIATION and the INTERNATIONAL UNION OF ELEVATOR CONSTRUCTORS

MEMORANDUM OF AGREEMENT by and between the WINDOW AND PLATE GLASS DEALERS' ASSOCIATION and DISTRICT COUNCIL NO. 9 GLAZIERS LOCAL UNION #1087

AGREEMENT OF WORKING CONDITIONS between INDUSTRIAL INSULATION CONTRACTORS OF SOUTHERN NEW YORK and THE INTERNATIONAL ASSOCIATION OF HEAT AND FROST INSULATORS AND ALLIED WORKERS LOCAL #91

AGREEMENT between FABRICATORS, ERECTORS AND REINFORCING CONTRACTORS' ASSOCIATION OF THE HUDSON VALLEY, INC. and LOCAL UNION NO. 417 OF THE INTERNATIONAL ASSOCIATION OF BRIDGE, STRUCTURAL, ORNAMENTAL AND REINFORCING IRON WORKERS

INDEPENDENT MILLWRIGHT AGREEMENT between NEW YORK CITY MILLWRIGHT CONTRACTORS' ASSOCIATION and THE DISTRICT COUNCIL OF NEW YORK CITY AND VICINITY OF THE UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA and MILLWRIGHT LOCAL 740

AGREEMENT between MASTER PAINTERS and DISTRICT COUNCIL NO. 9

RESILIENT FLOOR COVERERS AGREEMENT between THE GREATER NEW YORK FLOOR COVERERS ASSOCIATION, INC. and THE DISTRICT COUNCIL OF NEW YORK AND VICINITY OF THE UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA

AGREEMENT between UNITED UNION OF ROOFERS, WATERPROOFERS AND ALLIED WORKERS, LOCAL UNION NO. 8 and ROOFING & WATERPROOFING CONTRACTORS ASSOCIATION OF NEW YORK AND VICINITY

COMMERCIAL AGREEMENT between LOCAL UNION NO. 38 OF THE INTERNATIONAL ASSOCIATION OF SHEET METAL, AIR, RAIL AND TRANSPORTATION WORKERS (SMART) and SHEET METAL AND ROOFING CONTRACTORS' ASSOCIATION OF SOUTHEASTERN

NEW YORK

AGREEMENT between NATIONAL FIRE SPRINKLER ASSOCIATION, INC. and ROAD SPRINKLER FITTERS' LOCAL UNION NO. 669

AGREEMENT HEAVY & HIGHWAY between TEAMSTERS UNION LOCAL 445, IBT, AFL-CIO and INDIVIDUAL EMPLOYERS

LOCAL UNION NO. 7 TILE, MARBLE, AND TERRAZZO, AFL-CIO OF NEW YORK AND NEW JERSEY AGREEMENT between the MARBLE INDUSTRY OF NEW YORK, INC. and THE MARBLE POLISHERS AND MAINTENANCE FINISHERS, LOCAL NO. 7 of the INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTSMEN July 1, 2018-June 30, 2022
AGREEMENT HEAVY & HIGHWAY between TEAMSTERS UNION LOCAL 445, IBT, AFL-CIO and INDIVIDUAL EMPLOYERS

AGREEMENT between THE GREATER NEW YORK AND NEW JERSEY TILE CONTRACTORS' ASSOCIATION, INC. and THE TILE SETTERS AND TILE FINISHERS UNION OF NEW YORK AND NEW JERSEY, LOCAL UNION NO. 7 OF THE INTERNATIONAL UNIO OF BRICKLAYERS AND ALLIED CRAFTWORKERS

AGREEMENT between the MOSAIC, TERRAZZO AND CHEMICAL PRODUCT DECORATIVE FINISHER MASONS WORKERS ASSOCIATION LOCAL NO. 7 OF NEW YORK NEW JERSEY & VICINITY INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS and MARBLE TERRAZZO AND SPECIALTY CONTRACTORS ASSOCIATION, INC.

BUILDING AGREEMENT between LABORERS' LOCAL UNION NO. 17 and CONSTRUCTION CONTRACTORS' ASSOCIATION of the HUDSON VALLEY, INC.

HEAVY, HIGHWAY & SITE AGREEMENT between LABORERS' LOCAL UNION NO. 17, AGC OF AMERICA and CONSTRUCTION INDUSTRY COUNCIL

MECHANICAL CONTRACTORS' ASSOCIATION OF ROCKLAND, ORANGE, SULLIVAN COUNTIES and PLUMBERS & STEAMFITTERS LOCAL NO. 373

AGREEMENT between INTERNATIONAL UNION OF NORTH AMERICA OPERATING ENGINEERS LOCAL UNION NO. 825 INDEPENDENT AGREEMENT

SCHEDULE A COLLECTIVE BARGAINING AGREEMENT can be viewed by visiting the Hudson Valley Building and Construction Trades Council website: builditunion.org
Username: hudsonvalley
Password: buildingtrades

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY SCHEDULE A AGREEMENTS WITH THE RESPECTIVE UNIONS SIGNATORY TO THIS PROJECT LABOR AGREEMENT.

For questions about this Agreement or Schedule A contact:

Todd Diorio (845) 565-2737 or email tdiorio555@aol.com
President, HVBCTC

SCHEDULE B - LETTER OF ASSENT

The undersigned party confirms that it agrees to be bound to the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER Project Labor Agreement ("PLA") entered into between Hudson Valley Building and Construction Trades Council ("Council") and the County of Ulster ("County"), to the same extent as if it were a party thereto and understands that such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Agreement and its Schedules are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor ("Contractor") on the Project known as the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER project and located within the County (the "Project"), for and in consideration of the award to it of a contract to perform work on the Project, and in further consideration of the mutual promises made in the PLA, a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the PLA, together with any and all schedules, amendments, and supplements now existing or which are later made thereto;

(2) Agrees to be bound by, and incorporates and adopts the legally established collective bargaining agreements in Schedule "A" of the PLA and local trust agreements referred to Article 11 of the PLA and this Letter of Assent for this Project;

(3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor;

(4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of the PLA. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier Subcontractor it engages to work on the Project. Labor harmony disputes/issues shall be subject to Articles 7, 8, 9 and 10 of the PLA;

(5) Agrees to secure from any Contractor(s) (as defined in the PLA) which is or becomes a Subcontractor (of any tier) on the Project, a duly executed Agreement identical to this document;

(6) Agrees that it will not invoke any "Most Favored Nations Clause" that may be

contained in any of its Collective Bargaining Agreements with affiliated Unions as a result of the application of the PLA to this Project.

Dated: _____ _____

Name of Contractor

By: _____

Print Name: _____

Title _____

Address:

Phone:

E-mail:

Employer EIN_____Employer NYS IU _____WC#_____

Sworn to before me this

_____day of_____, 20_____

_____

Notary Public

SCHEDULE C — ADMINISTRATION OF AGREEMENT; DESIGNEE

Name of Project: ULSTER COUNTY GOVERNMENT OPERATIONS CENTER

The Owner shall name a Designee to administer this Agreement. The Designee shall be notified in the event any jurisdictional issue, grievance, or other matter concerning this PLA arises, and such Designee shall actively take part in the resolution of the issue. Any signatory Union may request the Designee's assistance in rectifying an issue.

The Designee's contact information is as follows:

_____(Office Phone)

_____(Cell Phone)

_____(Email)

OWNER

_____

(Signature)

_____

(Print)

_____

(Title)

SCHEDULE D — NATIONAL PLAN

A copy of National Plan for the Settlement of Jurisdictional Disputes can be viewed by visiting the Hudson Valley Building and Construction Trades website: buildiunion.org

Username: hudsonvalley Password: buildingtrades

SCHEDULE E — PROPOSED TRADE ASSIGNMENTS

SCHEDULE F — COLLECTIVELY BARGAINED WORKERS COMPENSATION ALTERNATIVE DISPUTE RESOLUTION
(ADR Agreement)

A copy of the Collectively Bargained Workers Compensation Alternative Dispute Resolution (ADR Agreement) can be viewed by visiting the Hudson Valley Building and Construction Trades website: builditunion.org

Username: hudsonvalley Password: buildingtrades

Schedule G

Specialty vendors and contractors excluded work:

1. Employees of design and engineering firms performing non construction services are excluded in section 3.3. Including, but not limited to, communications, tower design and engineering, and microwave system design and engineering by Aviat US, Inc.
2. Employees of vendor or contractor (Motorola Solutions, Electronic Solutions or others) providing public safety radio and 911 phone system and technical equipment related to are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes IBEW local 363 may be assigned wire pulling under the electrical contractor, in which this work will be performed under terms and conditions of this project labor agreement.
3. Employees of vendors or contractors involved in audio visual are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling under electrical contractor in which work will be performed under terms and conditions of this project labor agreement.
4. Employees of vendors or contractors of network carriers such as, but not limited to, Crown Castle, Verizon, Spectrum, and Archtop Fiber, are responsible for deploying fiber or copper communication lines to the facility through respective conduit(s)and terminating at the respective network demarc locations within the facility/server/equipment rooms and work related to specialized and technical equipment are excluded from this agreement. All hardpiping and conduit installation and related excavation, trenching and backfilling shall be performed by the trade's signatory to this project labor agreement and work will be performed under the terms and conditions of this project labor agreement.
5. Employees of vendors or contractors such as, but not limited to, New Castle performing VOIP professional serviced. This work includes configuring and interfacing with servers, network switches, and communication services to extend and deliver VOIP servers to facility including specialized and technical equipment are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling walls under the electrical contractor in which this work will be performed under the terms and conditions of the project labor agreement.
6. Employees of Ulster County performing IT work such as racking, network equipment, connecting to LAN/WAN infrastructure and associated power to provision devices own and configured on behalf of the county including, but not limited to, personal computers, servers, switches, routers, firewalls, load balances, network access and gateways are excluded under this agreement.
7. Employees of Securitas providing countywide security and access solution provider and fire detection shall be excluded from this agreement. All hardpiping to be installed by IBEW local 363. For coordination purposes IBEW Local 363 may be assigned wire

pulling under the electrical contractor in which this work will be performed under the terms and conditions of this project labor agreement.

8. Employees of CB2O performing installation of IT computer and networking equipment when under separate contractor when assisting Ulster County IT personnel All hardpiping, if any, to be installed by IBEW Local 363.

9. Employees of Adirondak or others on OGS contract performing or installing low voltage connectivity and certification of structured cabling including maintenance of structured cabling and LAN infrastructure. Hardpiping to be installed by IBEW 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling under the electrical contractor, in which terms and conditions of this project labor agreement shall apply.

10. Employees of Xybix or employees of a subcontractor of Xybix performing installation of PSAP and EOC furniture are excluded from this agreement.

11. All work by employees of contractor or vendor associated with the removal of oil tanks and removal of contaminated material from the lands owned by the County but not part of the projects site plan.

Note: The does not preclude the above excluded vendors or contractors from hiring or utilizing tradesworkers affiliated with the trades signatory to this agreement as needed. Terms and conditions of this agreement shall apply to those employees hired.

SCHEDULE A — LOCAL COLLECTIVE BARGAINING AGREEMENTS

ARTICLES OF AGREEMENT between the INTERNATIONAL BROTHERHOOD OF BOILERMAKERS, IRON SHIP BUILDERS, BLACKSMITHS, FORGERS & HELPERS, AFL-CIO and THE FIRMS WHOSE SIGNATURES ARE AFFIXED HERETO January 1, 2018 -December 31, 2020

AGREEMENT by and between THE CONSTRUCTION CONTRACTORS' ASSOCIATION OF THE HUDSON VALLEY, BUILDING CONTRACTORS ASSOCIATION, AND THE MASON AND CONCRETE CONTRACTORS ASSOCIATION OF THE HUDSON VALLEY and THE INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS LOCAL 1 NEW YORK June 1, 2017 - May 31, 2020

AGREEMENT between THE ASSOCIATIONS and the NORTH ATLANTIC STATE REGIONAL COUNCIL OF CARPENTERS LOCAL UNION 279 May 1, 2019 -April 30, 2022

AGREEMENT by and between the HUDSON VALLEY CHAPTER, NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION and LOCAL UNION 363, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS April 1, 2018 - March 31, 2022

AGREEMENT by and between the NATIONAL ELEVATOR BARGAINING ASSOCIATION and the INTERNATIONAL UNION OF ELEVATOR CONSTRUCTORS July 9, 2017 -July 8, 2022

MEMORANDUM OF AGREEMENT by and between the WINDOW AND PLATE GLASS DEALERS' ASSOCIATION and DISTRICT COUNCIL NO. 9 GLAZIERS LOCAL UNION #1087 May 1, 2017-
April 30, 2023

AGREEMENT OF WORKING CONDITIONS between INDUSTRIAL INSULATION CONTRACTORS OF SOUTHERN NEW YORK and THE INTERNATIONAL ASSOCIATION OF HEAT AND FROST INSULATORS AND ALLIED WORKERS LOCAL #91 May 30, 2016 - May 26, 2019

AGREEMENT between FABRICATORS, ERECTORS AND REINFORCING CONTRACTORS' ASSOCIATION OF THE HUDSON VALLEY, INC. and LOCAL UNION NO. 417 OF THE INTERNATIONAL ASSOCIATION OF BRIDGE, STRUCTURAL, ORNAMENTAL AND REINFORCING IRON WORKERS July 1, 2018-June 30, 2021

INDEPENDENT MILLWRIGHT AGREEMENT between NEW YORK CITY MILLWRIGHT CONTRACTORS' ASSOCIATION and THE DISTRICT COUNCIL OF NEW YORK CITY AND VICINITY OF THE UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA and MILLWRIGHT LOCAL 740 July 1, 2011 -June 30, 2017

AGREEMENT between MASTER PAINTERS and DISTRICT COUNCIL NO. 9 May 1, 2014 -April 30,2020

RESILIENT FLOOR COVERERS AGREEMENT between THE GREATER NEW YORK FLOOR COVERERS ASSOCIATION, INC. and THE DISTRICT COUNCIL OF NEW YORK AND VICINITY OF THE UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA September 16, 2016 -June 30, 2024

AGREEMENT between UNITED UNION OF ROOFERS, WATERPROOFERS AND ALLIED WORKERS, LOCAL UNION NO. 8 and ROOFING & WATERPROOFING CONTRACTORS ASSOCIATION OF NEW YORK AND VICINITY July 1, 2019 -April 30, 2022

COMMERCIAL AGREEMENT between LOCAL UNION NO. 38 OF THE INTERNATIONAL ASSOCIATION OF SHEET METAL, AIR, RAIL AND TRANSPORTATION WORKERS (SMART) and SHEET METAL AND ROOFING CONTRACTORS' ASSOCIATION OF SOUTHEASTERN

NEW YORK May 1, 2019-April 30, 2024

AGREEMENT between NATIONAL FIRE SPRINKLER ASSOCIATION, INC. and ROAD SPRINKLER FITTERS' LOCAL UNION NO. 669 April 1, 2016-March 31, 2021

AGREEMENT HEAVY & HIGHWAY between TEAMSTERS UNION LOCAL 445, IBT, AFL-CIO and INDIVIDUAL EMPLOYERS May 1, 2017 -April 30, 2020

LOCAL UNION NO. 7 TILE, MARBLE, AND TERRAZZO, AFL-CIO OF NEW YORK AND NEW JERSEY AGREEMENT between the MARBLE INDUSTRY OF NEW YORK, INC. and THE MARBLE POLISHERS AND MAINTENANCE FINISHERS, LOCAL NO. 7 of the INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTSMEN July 1, 2018-June 30, 2022
AGREEMENT HEAVY & HIGHWAY between TEAMSTERS UNION LOCAL 445, IBT, AFL-CIO and INDIVIDUAL EMPLOYERS May 1, 2017 -April 30, 2020

AGREEMENT between THE GREATER NEW YORK AND NEW JERSEY TILE CONTRACTORS' ASSOCIATION, INC. and THE TILE SETTERS AND TILE FINISHERS UNION OF NEW YORK AND NEW JERSEY, LOCAL UNION NO. 7 OF THE INTERNATIONAL UNIO OF BRICKLAYERS AND ALLIED CRAFTWORKERS June 2, 2017 -June 2, 2021

AGREEMENT between the MOSAIC, TERRAZZO AND CHEMICAL PRODUCT DECORATIVE FINISHER MASONS WORKERS ASSOCIATION LOCAL NO. 7 OF NEW YORK NEW JERSEY & VICINITY INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS and MARBLE TERRAZZO AND SPECIALTY CONTRACTORS ASSOCIATION, INC. July 1, 2017-Jine 30,2022

BUILDING AGREEMENT between LABORERS' LOCAL UNION NO. 17 and CONSTRUCTION CONTRACTORS' ASSOCIATION of the HUDSON VALLEY, INC. June 1, 2017 - May 31, 2020

HEAVY, HIGHWAY & SITE AGREEMENT between LABORERS' LOCAL UNION NO. 17, AGC OF AMERICA and CONSTRUCTION INDUSTRY COUNCIL May 1, 2017 — April 30, 2020

MECHANICAL CONTRACTORS' ASSOCIATION OF ROCKLAND, ORANGE, SULLIVAN COUNTIES and PLUMBERS & STEAMFITTERS LOCAL NO. 373 May 2019 — April 2021

AGREEMENT between INTERNATIONAL UNION OF NORTH AMERICA OPERATING ENGINEERS LOCAL UNION NO. 825 INDEPENDENT AGREEMENT July 1, 2019

SCHEDULE A COLLECTIVE BARGAINING AGREEMENT can be viewed by visiting the Hudson Valley Building and Construction Trades Council website: builditunion.org
Username: hudsonvalley
Password: buildingtrades

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY SCHEDULE A AGREEMENTS WITH THE RESPECTIVE UNIONS SIGNATORY TO THIS PROJECT LABOR AGREEMENT.

For questions about this Agreement or Schedule A contact:

Todd Diorio (845) 565-2737 or email tdiorio555@aol.com
President, HVBCTC

SCHEDULE B - LETTER OF ASSENT

The undersigned party confirms that it agrees to be bound to the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER Project Labor Agreement ("PLA") entered into between Hudson Valley Building and Construction Trades Council ("Council") and the County of Ulster ("County"), to the same extent as if it were a party thereto and understands that such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Agreement and its Schedules are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor ("Contractor") on the Project known as the ULSTER COUNTY GOVERNMENT OPERATIONS CENTER project and located within the County (the "Project"), for and in consideration of the award to it of a contract to perform work on the Project, and in further consideration of the mutual promises made in the PLA, a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the PLA, together with any and all schedules, amendments, and supplements now existing or which are later made thereto;

(2) Agrees to be bound by, and incorporates and adopts the legally established collective bargaining agreements in Schedule "A" of the PLA and local trust agreements referred to Article 11 of the PLA and this Letter of Assent for this Project;

(3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor;

(4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of the PLA. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier Subcontractor it engages to work on the Project. Labor harmony disputes/issues shall be subject to Articles 7, 8, 9 and 10 of the PLA;

(5) Agrees to secure from any Contractor(s) (as defined in the PLA) which is or becomes a Subcontractor (of any tier) on the Project, a duly executed Agreement identical to this document;

(6) Agrees that it will not invoke any "Most Favored Nations Clause" that may be

contained in any of its Collective Bargaining Agreements with affiliated Unions as a result of the application of the PLA to this Project.

Dated: _____ _____
Name of Contractor

By: _____

Print Name: _____

Title _____

Address:

Phone:

E-mail:

Employer EIN_____Employer NYS IU_____WC#_____

Sworn to before me this

_____day of_____, 20____

_____
Notary Public

SCHEDULE C — ADMINISTRATION OF AGREEMENT; DESIGNEE

Name of Project: ULSTER COUNTY GOVERNMENT OPERATIONS CENTER

The Owner shall name a Designee to administer this Agreement. The Designee shall be notified in the event any jurisdictional issue, grievance, or other matter concerning this PLA arises, and such Designee shall actively take part in the resolution of the issue. Any signatory Union may request the Designee's assistance in rectifying an issue.

The Designee's contact information is as follows:

_____(Office Phone)

_____(Cell Phone)

_____(Email)

OWNER

_____

(Signature)

_____

(Print)

_____

(Title)

SCHEDULE D — NATIONAL PLAN

A copy of National Plan for the Settlement of Jurisdictional Disputes can be viewed by visiting the Hudson Valley Building and Construction Trades website: buildituniion.org

Username: hudsonvalley Password: buildingtrades

SCHEDULE E — PROPOSED TRADE ASSIGNMENTS

SCHEDULE F — COLLECTIVELY BARGAINED WORKERS COMPENSATION ALTERNATIVE DISPUTE RESOLUTION (ADR Agreement)

A copy of the Collectively Bargained Workers Compensation Alternative Dispute Resolution (ADR Agreement) can be viewed by visiting the Hudson Valley Building and Construction Trades website: builditunion.org

Username: hudsonvalley Password: buildingtrades

Schedule G

Specialty vendors and contractors excluded work:

1. Employees of design and engineering firms performing non construction services are excluded in section 3.3. Including, but not limited to, communications, tower design and engineering, and microwave system design and engineering by Aviat US, Inc.
2. Employees of vendor or contractor (Motorola Solutions, Electronic Solutions or others) providing public safety radio and 911 phone system and technical equipment related to are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes IBEW local 363 may be assigned wire pulling under the electrical contractor, in which this work will be performed under terms and conditions of this project labor agreement.
3. Employees of vendors or contractors involved in audio visual are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling under electrical contractor in which work will be performed under terms and conditions of this project labor agreement.
4. Employees of vendors or contractors of network carriers such as, but not limited to, Crown Castle, Verizon, Spectrum, and Archtop Fiber, are responsible for deploying fiber or copper communication lines to the facility through respective conduit(s)and terminating at the respective network demarc locations within the facility/server/equipment rooms and work related to specialized and technical equipment are excluded from this agreement. All hardpiping and conduit installation and related excavation, trenching and backfilling shall be performed by the trade's signatory to this project labor agreement and work will be performed under the terms and conditions of this project labor agreement.
5. Employees of vendors or contractors such as, but not limited to, New Castle performing VOIP professional serviced. This work includes configuring and interfacing with servers, network switches, and communication services to extend and deliver VOIP servers to facility including specialized and technical equipment are excluded from this agreement. All hardpiping to be installed by IBEW Local 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling walls under the electrical contractor in which this work will be performed under the terms and conditions of the project labor agreement.
6. Employees of Ulster County performing IT work such as racking, network equipment, connecting to LAN/WAN infrastructure and associated power to provision devices own and configured on behalf of the county including, but not limited to, personal computers, servers, switches, routers, firewalls, load balances, network access and gateways are excluded under this agreement.
7. Employees of Securitas providing countywide security and access solution provider and fire detection shall be excluded from this agreement. All hardpiping to be installed by IBEW local 363. For coordination purposes IBEW Local 363 may be assigned wire

pulling under the electrical contractor in which this work will be performed under the terms and conditions of this project labor agreement.

8. Employees of CB2O performing installation of IT computer and networking equipment when under separate contractor when assisting Ulster County IT personnel All hardpiping, if any, to be installed by IBEW Local 363.

9. Employees of Adirondak or others on OGS contract performing or installing low voltage connectiviety and certification of structured cabling including maintenance of structured cabling and LAN infrastructure. Hardpiping to be installed by IBEW 363. For coordination purposes, IBEW Local 363 may be assigned wire pulling under the electrical contractor, in which terms and conditions of this project labor agreement shall apply.

10. Employees of Xybix or employees of a subcontractor of Xybix performing installation of PSAP and EOC furniture are excluded from this agreement.

Note: The does not preclude the above excluded vendors or contractors from hiring or utilizing tradesworkers affiliated with the trades signatory to this agreement as needed. Terms and conditions of this agreement shall apply to those employees hired.

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 12 00

SUMMARY OF WORK – MULTIPLE PRIME CONTRACTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Division 0 & 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Project Locations: 10 Paradies Lane, New Paltz, NY 12561

B. Owner: Ulster County

C. Owner's Representative: To be determined during construction.

D. Architect Identification: Urbahn Architects – Christopher Young, Associate

E. Construction Manager: The Palombo Group, 22 Noxon Street, Poughkeepsie, NY 12601

1. Construction Manager Representative: Luis Rodriguez, President.

2. 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.

F. Project Identification: Ulster County Government Operations Center

1.3 SUMMARY OF WORK – LIST OF CONTRACTS

A. The work will be constructed under multiple prime contracts. One set of contract documents is issued covering multiple contracts. Each Prime Contract/Contractor is defined as:

1. CONTRACT 1: GENERAL CONSTRUCTION WORK
   a. Also referred to as: "General Contractor" or "GC"
2. CONTRACT 2: MECHANICAL CONSTRUCTION WORK
   a. Also referred to as: "Mechanical Contractor" or "MC"
3. CONTRACT 3: ELECTRICAL CONSTRUCTION WORK
   a. Also referred to as: "Electrical Contractor" or "EC"
4. CONTRACT 4: PLUMBING CONSTRUCTION WORK
   a. Also referred to as: "Plumbing Contractor" or "PC"
5. CONTRACT 5: SITE CONSTRUCTION WORK
   a. Also referred to as: "Site Contractor", "SC" or "Contractor responsible for Site Work"
6. CONTRACT 6: FIRE ALARM AND SECURITY CONSTRUCTION WORK
   a. Also referred to as: "Fire Alarm and Security Contractor" or "FSC"
7. CONTRACT 7: AUDIO VISUAL CONSTRUCTION WORK
   a. Also referred to as: "Audio-Visual Contractor" or "AVC"
8. CONTRACT 8: FURNITURE CONSTRUCTION WORK
   a. Also referred to as "Furniture Contractor" or "FC"

1.4 GENERAL REQUIREMENTS FOR WORK UNDER SEPARATE CONTRACTS TO BE INCLUDED IN EACH CONTRACT:

A. GENERAL REQUIREMENTS

1. The project will be constructed under a multiple-prime contracting arrangement with the Owner awarding and holding separate Contracts. Each contractor shall furnish all labor, material, tools, equipment, access equipment, supervision, layout, delivery, trucking, material handling equipment, shop drawings, submittals, coordination, etc. necessary to complete the work described in the Division of Work of their respective Contracts and based upon a complete set of Contract Documents.
2. One set of documents is issued covering all multiple contracts. Each contractor is to review all drawings and specifications for complete understanding and knowledge of the work.
3. The following Contract Documents are specifically included and defined as integral to each Contract.
    a. Bidding Requirements
    b. Performance and Payment Bonds
    c. Conditions of the Contract, including
        1) General Conditions
        2) Insurance Requirements
        3) NYS Prevailing Wage Rates.
        4) Project Labor Agreement (For Contracts 1-5)
4. 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.
5. Termination, removal, and restoration of its temporary facilities shall be provided by each contract for its own Work.
6. All Contractors are responsible for reviewing Drawings and Specifications as they pertain to their scope of work mentioned in the contract documents. Scopes of work referenced may be found in multiple locations throughout the Drawings and Specifications. Each Contractor is responsible to review all Drawings and Specifications for every contract to gain a complete understanding and knowledge of the entire project, to determine how the work of each contract is to interface with every other contract.
7. **Each Prime Contractor must self-perform a minimum of 25% of their scope of work** (to be calculated based on contract values of subcontractors with respect to Prime Contract Total). This requirement will be verified prior to the contract award and monitored throughout the project.
8. Local customs and trade union jurisdictional settlements do not control the scope of work included in each prime contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.
9. Each Contractor has been given the opportunity prior to bid to inspect the entire Project site for interferences to their Contract work and agrees to accept the site as it exists on the date of the bid opening.
10. Each Contractor shall submit a proposed subcontractors list within 14 days of the start of the Project with any additional qualifications as required per Specifications. An updated copy of this list is to be attached with each Application for Payment.

B. **SCHEDULE**

1. See Project Milestone Schedule.
2. **Contractor Construction Project Schedule**: Each Contractor is required to engage a qualified CPM Construction Scheduling Service to generate (or provide equivalent self-performed scheduling services with Construction Manager approval) and submit a construction schedule based on the dates of the Contract Milestone Schedule. See Construction Progress Documentation / Schedule Specifications for additional requirements.
   a. Each Contractor's construction schedule is to be submitted for review and comment no later than 3 weeks after a "Notice to Proceed" or "Intent to Award" for the work is issued.
   b. Contractor Project Schedules are to be assembled in compliance with the Contract Milestone Schedule.
   c. For the initial Construction Project Schedule, the Project Milestone Schedule is to be used as a basis for schedule activities and shall be used to figure any predecessor activities.
   d. If there is schedule information pending from other Contractors to schedule an activity on the Project Schedule, then the Contractor shall indicate on the schedule the duration and sequence of the activity and further indicate the item as pending and identify the predecessor activity required to schedule the pending activity.
   e. Include notes regarding activities that may impact other Contractor's activities.
   f. Each Contractor has the responsibility to respond to questions from other Contractors with regards to the sequence and completion dates/durations of activities.
   g. A copy of the updated Project schedule is to be included with each Application for Payment.
   h. Multiple Crews: To maintain the project schedule, each Contractor is to provide multiple crews. Each crew is to be furnished with its own supervision, equipment, and other means necessary to maintain the Project Schedule.
   i. If the Contractor fails to provide a detailed construction schedule within 14 days upon request by the Construction Manager, then the Owner retains the right to hire CPM Scheduling Services to review the work of the Contract and generate detailed schedule information to perform the work of the contract to meet the date of substantial completion and deduct costs from the Contractor who has failed to provide the contractual scheduling services. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required schedule after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide the scheduling administrative services on behalf of the Contractor.
   j. If the Critical Path of the projected Substantial Completion Date exceeds the Substantial Completion Date of the Milestone Schedule or other dates listed in the Milestone Schedule, then the contractor designated as the entity responsible for producing the schedule is to identify the critical path items and notify the Construction Manager. If the conflict cannot be resolved, then a meeting is to be scheduled between each Contractor to review the resolution options which may require Contractors to provide additional Crews/Manpower.
3. **Master Construction Schedule:** The **General Contractor** is required to review all Construction Project Schedules submitted by the other Contractors and entities performing work on the Project and combine into a complete coordinated Master Construction schedule that has been coordinated with all other work on the Project. To be submitted no later than 2 weeks after all other Contractors have submitted their respective Construction Schedules.

4. **2 Week Look Ahead Schedule**: Each Contractor will be required to submit a detailed 2 week look ahead schedule that indicates which activities are scheduled each day for all periods each contractor is performing any amount of work. To be updated and submitted prior to each Project Meeting or Schedule Coordination Meeting.
5. **Submittal Schedule**: Each Contractor is required to review all Project Specifications and provide a list of all submittals and closeout documents expected to be submitted for the Project to be reviewed by the Architect/Construction Manager.
    a. Submittal Schedule to be submitted on form specified by the Project or as directed by Construction Manager.
    b. Submittal Schedule items to be broken down into a list by individual submittal document. **All expected individual closeout submittals** to also be included in the Submittal Schedule prior to approval. Closeout Submittals may include but are not limited to: Operation and Maintenance Manuals, Record Documents, Warranties, Start Up and Test Reports, Training Documentation, Material Transmittals.
    c. Submittals to be grouped into the following types: Product Data, Shop Drawings, Samples/Mockups, and Closeout Documents: Maintenance Manuals, Record Drawings/Specifications, Warranties, Test Reports, Training Agenda's, Training Sign in Sheets, Maintenance Materials; and type "other".
    d. If the Contractor fails to provide a detailed submittal schedule by due date on Milestone Schedule or within 14 days upon request by the Construction Manager, then the Owner retains the right to hire outside services to review the specifications and generate the initial list of expected submittal and closeout items and deduct costs from the Contractor who has failed to provide the contractual submittal schedule. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required submittal schedule after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide these administrative services on behalf of the contractor.
6. **All contract scopes of work in unoccupied areas of work can be performed weekdays from 7:00 AM to 3:30 PM unless otherwise noted.** Work cannot be performed in occupied areas. Work shall be scheduled off-hours, vacations, and weekends for occupied areas. A Construction Manager Superintendent must be on site at all times that work is being performed.
    a. If a contractor fails to maintain the progress as indicated by the milestone schedule by no other fault but its own and requires overtime to complete the work; the contractor shall make arrangements with the Construction Manager 48 hours in advance and pay for a Construction Manager's superintendent at $125.00 per hour via deduct change order. If the cause for delay is multi-contract, then the costs shall be distributed evenly among contracts. Advise the Construction Manager 48 hours prior to commencing work inside the building.
7. When work is scheduled for second shift or off hours and occupied by the owner during the day; work areas and finishes must be restored back to original finished conditions at the end of each day for occupancy the following day.
8. Coordination of any utility and/or power interruption must be done with the Construction Manager. Shutdowns must occur during off-hours and on days as directed by the owner. Contractor overtime costs for off hours work to be included in Base Bid.
9. Schedule operations to avoid conflicts or interruptions to Owner's building operation as directed by the Construction Manager. Coordinate interruptions with the Construction Manager.

C. **SUPERVISION**

1. Each Contractor shall designate a full-time Field Superintendent to supervise the work of their own contract, who shall always be present on the job site when work is being performed; this person shall be familiar with Project and authorized to conclude matters relating to progress. In addition, each Contractor shall designate a single Project Manager to oversee all aspects of the Project.
    a. The proposed Field Superintendent and Project Manager for the project is to have at least five years of experience in the proposed position.
    b. Each Contractor shall submit resumes to the Construction Manager for the proposed Project Manager and Field Superintendent for the project. This information will be reviewed with the Owner, Architect and Construction Manager for approval.
    c. Should the Project Managers or Superintendent prove to be unqualified for the position at any point in the project, the Construction Manager shall issue a letter stating that the person is to be removed from involvement in the project. Action by the contractor must be made within seven working days of receipt of such letter.
    d. The Field Superintendent shall participate in providing scheduling information, Two Week Look Ahead Schedules, field coordination of layout when required, and provide quality control procedures of all work performed under the contract.
    e. **For Contracts #1, #2, #3, #4, and #5, provide a dedicated non-working non-trade supervisor to act as the Field Superintendent to supervise all work scheduled onsite. A working foreman is not sufficient to fulfill the role of the Field Superintendent.**
2. Each Prime contractor shall maintain within its field office a complete and current set of Contract Documents (including any Addenda, Change Orders, and Modifications thereto), Contract Record Drawings, approved shop drawings, samples, color schedules and other data pertinent to the Project.
3. Each Prime Contractor is to assemble an Employee List of all employees for all self-performed and subcontracted work and provide copies of OSHA cards for all employees on the Employee List.
4. Update the Employee List to add new employees which have been added to the project and include a copy of the employee list with each Application for Payment. Employee list with OSHA Cards to cross reference with the submitted Certified Payroll with each Application for Payment.
    a. When criminal background checks are specifically required on a Project, provide copies of Driver Licenses for Employee for background check purposes.
5. Any person in the Contractor's organization who conducts themselves in a manner that violates safety protocols, demonstrates insufficient professional/personal conduct, or behaviors deemed problematic or unprofessional on the Project can be directed to be removed immediately and permanently from the Project site by the Construction Manager or Owner.

D. **COORDINATION BETWEEN PRIME CONTRACTS**

1. Provide all Coordination responsibilities as indicated in COORDINATION Specification 013115.
2. Coordination Drawings in New Construction: Each Contractor is required to engage a qualified drafting agency capable of producing coordination drawings and models utilizing various industry standards and file formats including but not limited to: (Revit, AutoCAD, etc.).
3. The **Mechanical Contractor** will take on the additional responsibility of overseeing the coordination modeling/drawing process and provide additional clash detection reports of all models by other Contractors using the BIM Modeling Software for New Construction Building Work. The Mechanical Contractor is to communicate any issues that arise from other Contractors not fulfilling their obligations to the Construction Manager.
4. The **Construction Manager** will provide direction and communications between each Contractor and schedule coordination meetings as required.
5. **For ALL Construction: Each Contractor that requires preceding support work by others such as: openings, penetrations, structural support, utility trench layout, equipment pads, and any other work needed by a following Contractor, the following Contractor is required to provide a field mark out of their work** for any other Contractors who are to provide the preceding work for the following Contractor. Each Contractor is also to provide personnel onsite to supervise the installation of the preceding work as required. Layout to be based off the approved Shop Drawings generated from the Multi Trade approved Coordination Model/Drawings. Any roof openings/steel support required to be installed shall be marked out on the underside of the Roof Deck and on the Roof Exterior Surface by the contractor installing the items requiring the opening/support for the work of their own contract.
6. Access doors not shown on Architectural drawings and required for access to concealed systems for maintenance, access, or code requirements (valves, dampers, junction boxes) for the Work of each contract shall be furnished by each contract for its own Work to the **General Contractor** for installation in new wall, floor, or ceiling: construction. All access doors shall comply with Division 8 Section "Access Doors and Frames."

E. **OPENINGS, PENETRATIONS, EXISTING CEILINGS, PATCH TO MATCH RESTORATION, AND EMBEDDED ITEMS**

1. **Each Contractor** is to survey existing work and submit to the Construction Manager a list of damaged areas with preconstruction photos prior to commencing work. Any damage that occurs during construction and is not identified prior to the work shall be the responsibility of the contractor(s) working in that area to restore.
2. **Existing Ceilings (Ceiling Work):**
   a. In areas with existing suspended-drop-ceilings: **Each Contractor** shall provide ceiling removal/replacement/patching including ceiling grid for installation of new work, except for ceiling work specifically indicated on Architectural Drawings, in which case, the **General Contractor** shall be responsible for any Ceiling work indicated on Architectural Drawings. If Ceiling Types are not identified on drawings, then the Contractor shall figure drop ceiling removal and replacement. Replace damaged ceilings not identified as damaged prior to construction.
3. In **Renovation Construction:** (Existing: walls, partitions, floors, roofs, ceilings):
   a. **Each Contractor** shall provide: openings, sleeves, penetrations, lintels, round sleeves, roof steel reinforcement, concrete, masonry, cutting, patch to match after demolition, restoration, and painting as required to complete their respective work for a finished appearance, except when this work is specifically indicated on Architectural or Structural Drawings, in which case, the **General Contractor** shall provide the work indicated on Architectural or Structural Drawings. Each Contractor to reference typical details in Structural or Architectural Drawings for additional

requirements of this work. All exposed finishes must be patched to match adjacent finishes etc.; all concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall or deck conditions.

b. New roof openings and penetrations to be **provided by contractor responsible for Roofing** in that location as noted on Roofing or Architectural Drawings.

c. Round Penetrations larger than 8" will be considered an **Opening** with structural reinforcement to be **provided by the respective Contractor** requiring the opening.

4. In **New Construction** (New: walls, partitions, floors, ceilings, and roofs):

a. The **General Contractor** is required to review all Contract Drawings for all other Contractors to identify generally where Openings/Sleeves/Embed/Roof items will be required for ductwork, piping, and electrical/low voltage devices as depicted on all other Contract Drawings. Insulation thickness of the penetrating/opening item is to be considered for sizing of openings.

b. Notification of scheduling of new Wall, Floor, or Ceiling Construction is to be sent by the **General Contractor** at least 7 days prior to construction. Field Layout, Shop Drawings, Written Documentation, and onsite personnel are to be provided by the respective Contractor that requires the opening or sleeve during the new wall, floor, or ceiling construction. The **General Contractor** is to provide field layout of internal structural reinforcement to avoid conflict with new penetrations.

1) If the **General Contractor** does not notify the Construction Manager and contractors associated with new work, sleeves or openings of new wall or floor construction at least 7 days prior, then the GC is to provide the work needed to install these openings/penetrations once identified as missing. Submission of a Two-Week Schedule with specific locations sent directly to all Contractors and Construction Manager is sufficient for notification.

2) If Layout information and has not been provided to the **General Contractor** prior to scheduled installation of new wall/partition/floor (with 7-day notice), then the contractor that failed to provide the layout will be responsible for providing the new opening with any lintel, sleeve, or reinforcement required after the new wall or floor has been constructed.

c. **For new Masonry Walls, Concrete Walls, or Concrete floors**:

1) **Openings:** The **General Contractor** will provide all lintels, rebar, and other reinforcement for all through and recessed openings (rectangular, or as needed for round openings larger than 8" diameter) for all other contractors for work depicted on all other contract drawings associated with other contractors. **Each Contractor** is to provide sealing/fireproofing of these openings.

2) **Penetration Round Sleeves:** Each respective Contractor will furnish their own sleeves (when penetration is larger than 1-1/4") for their own work and turn them over to the **General Contractor** for installation.

a) **Round Openings larger than 8" Diameter in Masonry Walls will be considered an Opening** with reinforcement to be provided by **General Contractor.** Each respective Contractor requiring openings for round penetrations larger than 8" is still required to provide a sleeve for patching, firestopping, and sealing purposes.

b) Floor sleeves to be provided at sufficient height for "Water Dam".

c) Penetrations 1-1/4" or less shall be provided and installed by each respective contractor requiring penetration.

d) Each Contractor is to provide field layout of the installation location for their own sleeves.

e) Each Contractor is to provide sealing/fireproofing of penetrations and openings associated with their work. Escutcheons to be provided for all pipe penetrations in visible areas as needed.

3) **Embed Piping Conduits and back boxes:** Each respective Contractor requiring piping, conduits, device back boxes in walls or floors shall have manpower onsite during scheduled installation of new masonry walls, or concrete form assembly to install conduits, piping and back boxes as needed. Each Contractor is to provide sealing/fireproofing of penetrations and back boxes associated with their work.

d. **For <u>new</u> Stud Frame; Partitions, Walls, and Ceilings**:

1) **Openings**: The **General Contractor** will provide all stud wall reinforcement for all through and recessed openings for all other contractors for work depicted on all other contract drawings associated with other contractors. Each Contractor is to provide sealing/fireproofing of these openings.

2) **Penetration Round Sleeves:** Each respective Contractor will furnish and install sleeves for their own work. Each Contractor is to provide field layout of the installation location for their own sleeves. Each Contractor is to provide sealing/fireproofing of penetrations associated with their work. Escutcheons to be provided for all pipe penetrations in visible areas as needed.

3) **Embed Piping, Conduits, and back boxes:** Each respective Contractor requiring piping, conduits and device backboxes in walls, floors or ceilings shall have manpower onsite during scheduled installation of new stud framing assembly to install conduits, piping, and back boxes as needed. Each Contractor is to provide sealing/fireproofing of penetrations and back boxes associated with their work.

e. **For embed items in new floors and flooring finishes**:

1) The **General Contractor** shall provide field layout of finished floor elevations. Each respective Contractor shall install any items to be embedded in the floor at the correct elevation required.

2) Each respective Contractor shall provide product data/shop drawings of the embedded items to the **General Contractor**.

3) The **General Contractor** and the respective contractor installing the embed items shall review together the elevations of the installed embed items and check prior to floor install if all embed items are at the correct heights.

4) If the elevation of an embedded item is not at the correct height, then the **General Contractor** shall notify the construction Manager and associated contractor of the discrepancy and provide the associated contractor the opportunity to correct.

5) Written Documentation of the embed item height verification shall be recorded by each contractor and submitted to the Construction Manager prior to floor installation (finish floor or subfloor/slab).

5. **For Roof Construction:**

(**General Contractor** shall provide responsibilities of **Roofing Contractor** for locations where the **General Contractor** is responsible to provide <u>Roof Work</u>).

a. All blocking, flashing, and cutting of roof material/decking and installation is by the **Roofing Contractor**.

b. Structural Steel Support framing for all roof openings, roof penetrations, roof drains and roof equipment is to be furnished and installed **General Contractor**, review all contract drawings for all roof opening/equipment locations.

c. All Roof Curbs, Equipment Curbs, Duct curbs, roof drains, and pipe portals are to be furnished by **each respective contractor** associated with the new work and installed by the **Roofing Contractor**. Roof curbs to be placed on roof by the contractor furnishing the curb. Once curb/opening is installed, the **Roofing Contractor** is to provide temporary weathertightness of curb with plywood until new equipment/work is installed. Pipe boots for plumbing vents to be provided by **Roofing Contractor**.

d. Referenced Roof/Structural Work noted above shall be marked out on the underside of the Roof Deck and on the Roof Exterior Surface via Field Layout. Field Layout to be provided by **each respective Contractor** requiring the Roof/Structural Work to support the work of their own Contract.

6. Firestopping and penetration sealing for the Work of each contract shall be provided by each contractor for its own Work for all penetrations and openings. Firestopping shall comply with Division 7 Sections "Through-Penetration Firestop Systems". Products are to be submitted to the Architect for Approval.
   a. **Each contractor** is to provide acoustic sealants for all their respective penetrations, openings, and back boxes for items that do not require firestopping.
7. Each contractor shall return areas disturbed by their work activities to condition prior to start of work as initially documented by Contractor.

F. **CONCRETE PADS AND BASES FOR EQUIPMENT**

1. Concrete for the Work of each contract shall be provided by **each Contractor** as needed for completion of their own Work, unless specifically assigned to another Contract.
   a. Concrete Equipment Pads and Bases specifically shown to be provided on the Architectural or Structural Drawings are to be provided by the **General Contractor,** and if specifically shown to be provided on the Civil Drawings, then those pads or bases are to be provided by the **Contractor responsible for providing the Site Work or Site Contractor.**
   b. All other pads or bases are to be provided by the contractor providing the equipment associated with the concrete pad or base.

G. **TRENCHES, EXCAVATION, BACKFILL, AND INFILL FOR UTILITIES**

1. Utility Trench Excavation is considered: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all Contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
   a. Utility Trench Excavation shall be provided as assigned per "Scope Delineation Areas" below:
      1) **For New Construction under new floors within new building perimeter + 5-Foot Zone from foundation perimeter: The General Contractor** shall provide: Utility Trench Excavation for the underground work of all contracts as shown on all drawings.
      2) **For New Construction outside of the 5-foot zone from the new building foundation perimeter: The Contractor responsible for Site Work** shall provide: Utility Trench Excavation for the underground work of all contracts as shown on all drawings.
      3) **For Renovation Construction under existing floors within the existing building footprint: The General Contractor** shall provide: Utility Trench Excavation for the underground work of all contracts as shown on all drawings. **Floor infill and reinforcement shall be provided by the Contractor responsible for patching and providing new floor finishes.**
2. Utility Trench Excavation is to be provided for the following utilities (but not limited to):
   a. All underground Electrical/Telecom/Data/Fiber utilities and conduits shown on Electric/Civil/Telecommunications/Security Drawings.
   b. Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
   c. Floor boxes and associated conduits indicated on Electrical Drawings.
   d. Domestic Water Supply indicated on Plumbing/Civil Drawings.
   e. Sanitary/Sewer indicated on Plumbing/Civil Drawings.

f. Sprinkler Piping indicated on Fire Protection/Civil Drawings
g. Storm/Sump/Footing Drain indicated on Plumbing/Civil Drawings.
h. Geothermal Piping indicated on Mechanical/Civil Drawings.
i. Underground Refrigerant piping indicated on Mechanical Drawings.

H. **SAFETY**

1. Lead Based Paint precautions for the Work of each contract shall be provided by each contract for its own Work. Each Contractor shall provide procedures for OSHA Lead precautions.
2. Provide OSHA 10-hour training certificate for all employees prior to starting work on the site. In addition, these certificates must be sent in with certified payroll as new employees are hired in accordance with NYS DOL.
3. Contractor to provide potable cooled drinking water for its own employees.
4. Contractor to provide: Secure lockup of its own tools, materials, and equipment. Provide temporary enclosures/storage containers of materials as needed.
5. Contractor to provide: Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
6. All OSHA Safety, NYS Department of Labor, and hazardous materials regulations will be enforced on this project. All Contractors must submit a site-specific safety plan, a hazardous materials program, (all required data must be maintained at the job site), designate contractor safety supervisor, and attend safety meetings.
   a. Safety Meetings with Toolbox Talks will be required from each contractor weekly.
   b. Each contractor to maintain on site Material Safety Data Sheets (MSDS) for all materials utilized on site.
7. All personnel working on site shall always wear personnel protective equipment as required. All construction personnel are required to wear high visibility vests and visible identification when onsite. Hard Hats are required to be worn per OSHA requirements.
   a. Those without identification will be removed from the site at once. If the same individual fails to wear the identification a second time they will be removed and not be allowed back on site.
8. Each Contractor shall adhere to current COVID 19 policies / protocols.
9. Provide material lifting equipment and licensed operators required for the completion of Contract requirements, and complying with NYS Labor Laws, OSHA requirements, and other Federal, State, and local laws. All lifting operations (i.e. rigging of rooftop equipment) will require a written lift plan and operator licenses to be submitted for record 2 weeks in advance of scheduled lift date.
10. Provide Fire Prevention materials and equipment for fire protection related to the work of their own Contract. Provide fire extinguishers, fire blankets, and fire watch supervision during all "Hot Work" operations and as required by OSHA requirements.
11. All existing Owner-occupied buildings need to always remain operational. The contractors are responsible for maintaining all systems, such as but not limited to communications, fire alarm, clocks, electric, public address system, gas service, heat, etc.
12. Active Smoke Detectors temporarily covered are to be uncovered at the end of each day. If smoke detectors are frequently found to be left covered, then the Owner reserves the right to schedule a Construction Management Superintendent on overtime to check all smoke detectors on the project to be free of obstructions at the end of each day and the responsible contractor is to bear this cost.
13. Each Contractor is responsible for cabling or roping off all roof openings created from their own work in an OSHA approved manner. Provide all necessary fall protection.
14. If another Contractor discovers building or site conditions do not meet OSHA requirements, then that Contractor must notify the Construction Manager and is to not proceed without having the condition corrected to meet OSHA requirements.

15. Each Contractor is to provide safety protections for conditions created by the installation of their own work as per OSHA Guidelines.

I. **SITE ACCESS AND MATERIAL STORAGE:**

1. It is the Owner's intention to continue to occupy the existing buildings and site for normal operations during the Construction process. The Contractors all agree to:
   a. Cooperate with the Owner's personnel in maintaining and facilitating access to the buildings and its facilities by the staff, Owner's agents, service consultants and the public, throughout the construction process.
   b. Keep driveways and entrances serving the occupied building clear and available to the Owner, the Owner's employees, the public, and to emergency vehicles. Do not obstruct access to, or use these areas for parking, staging of equipment or materials. All access through these existing areas must be coordinated in advance and in accordance with the Owner's usage and occupancy schedule.
   c. Schedule construction operations to minimize any conflicts or interruptions to the daily functions. Coordinate any necessary interruptions with the designated project representative.
2. Each Contractor shall be onsite to receive their own material deliveries, store onsite, and protect until the material is ready to be installed in the final locations. Do not deliver materials directly to the Owner for receipt without acceptance of material approved by the Architect.
   a. Additional costs for double handling will not be permitted. Provide secure lock up of materials and provide protection as needed.
   b. Store all materials in conditions that are in accordance with manufacturers recommendations and requirements.
   c. Provide Storage Containers as needed for materials, tools, and equipment delivered to the Site. Materials stored outside of the staging area are to be relocated as necessary or as directed by the Construction Manager to not impede the scheduled work of others.
      1) Long term storage of deliverable materials shall not be stored in building and shall be stored either offsite, in staging area, or containers outside of the building to not obstruct construction activities.
   d. The Contractor shall replace all lost or damaged materials that have not been turned over to the Owner via signed and legible transmittal.
3. Secure Lock Up of Building and Site.
   a. The **General Contractor** shall provide secure lockup of doors, windows, openings of the new building, and site gate/fence(s) at the end of each working day. If other contractors are working past the Project working hours preventing secure lock up, then the General Contractor is to notify the Construction Manager for further direction.
   b. If the **General Contractor** is not scheduled to be onsite, then it will be the responsibility of the Contractors working onsite that day to provide building and/or site lock up.
   c. Propping open locked doors and leaving unattended will not be allowed by any Contractors. Personnel observed leaving doorways unsecure/propped and unattended may be directed to be removed from site.
   d. If the **General Contractor** or other solely working contractor (with no GC onsite) fails to provide secure lock up of the building and/or site at the end of each day, and has been documented at minimum of 3 instances, then the Construction Manager / Owner may provide their own building site lock up and deduct the labor costs from the responsible Contractor's contract sum.

4. Construction access to the site shall be limited to those designated for the contractor's personnel, equipment, and deliveries by the Owner. Contractors' staging, parking and storage shall be coordinated by the Construction Manager.

J. **CLEANING, AND PROTECTION**

1. All Contractors are responsible for any debris caused by their work. A Daily Debris Cleaning and disposal are required by each Contractor for the time periods and areas in which that Contractor is performing work.
2. If Contractor Daily Debris Cleaning is deemed insufficient, then on a day selected by the Construction Manager, each trade will assign at least one person to the weekly clean-up until cleaning is complete. The name of this person is to be submitted to the Construction Manager. Any Contractor not providing personnel will be charged for cleaning labor provided by others or as supplied by the Construction Manager.
3. **The General Contractor** shall provide Final Cleaning Service of all spaces in the building scheduled on the Contract Documents for Construction by any of the other Contractor, and equipment provided immediately before the final inspection.
    a. Provide professional cleaning of all dust and debris beyond the general daily debris clean up responsible by each contractor to restore all surfaces to a dust free condition.
    b. This includes any dust that have resulted from Construction by other Contractors and is to be included in the final cleaning if there is work indicated in these associate spaces on the Contract Drawings.
    c. This clause does not alleviate the other Contractors responsibility for daily cleaning of debris/material.
    d. Close off cleaned spaces from entry by other Contractors with visible indication.
    e. Maintain or lock down areas in a clean condition until the Owner occupies the space.
    f. Personnel: Experienced workman or professional cleaners approved by the Construction Manager and submitted 2 weeks prior to scheduled cleaning.
4. **The Contractor Responsible for Site work (Site Contractor) or by General Contractor** when no Site Contractor is contracted) shall be responsible for performing a final cleaning of the exterior site areas.
5. If a Contractor fails to provide their contractually obligated debris cleaning or final cleaning, then the Owner reserves the right to hire an outside cleaning contractor to perform the work on behalf of the Contractor until the cleaning requirements have been met and as required to meet the schedule.
6. Protection to be installed on all new floor surfaces and maintained until final coatings/waxes are installed, and then continued to be maintained until turnover to the owner. Heavy Duty Ram board to be installed in high traffic areas/egress pathways into each space or in areas where lighter protections cannot be maintained.
7. Furniture and Equipment in work areas shall be protected with plastic sheeting and maintained dust free through the period of active construction in the space. Reinstall sheeting as necessary due to damage during construction. Cleaning of unprotected furniture or equipment shall be the responsibility of the Contractor working in the associated space if protection is not installed.
8. Each **Contractor** shall close and protect their installed equipment or plumbing fixtures to prevent use during construction until the equipment or space has been turned over to the owner.
9. The Building Ventilation system shall be disable by the **Contractor(s)** in areas under construction until the areas are cleaned and turned over to the owner. Dirty air filters from Construction are to be replaced with new filters and duct cleaning to be provided by Contractors who did not disable the Ventilation System during construction prior to Substantial Completion.

K. **EQUIPMENT AND SYSTEMS: START UP, DEMONSTRATION, AND TRAINING**

1. Each Contractor is required to provide Start Up and Test Documentation for all equipment and systems installed under its respective contract, to be witnessed by Owner's representative and Construction Manager.
   a. Submit Start Up and Test Documentation for approval prior to equipment acceptance and warranty start date.
2. Each Contractor is to provide Start-up Reports, any custom configurations of equipment, any observed issues/deficiencies with the equipment, and certification if equipment meets all per the Manufacturer and Engineer requirements.
   a. Documentation of Construction Manager/Owners Representative witness of equipment or systems startup/testing does not constitute as acceptance of equipment or system.
3. If Equipment or system failure is discovered during initial startup or testing, then the warranty for the failed equipment shall not start until the equipment is corrected.
4. The Contractor is to submit a Demonstration and Training Agenda with Operation and Maintenance Manual for Architect approval prior to scheduling Demonstration and Training.
5. Training for Equipment or Systems shall not be scheduled until the equipment or system is accepted by the Architect.
6. If Construction Manager is not notified 48 hours in advance and available to witness Equipment start up or training, then the Contractor shall pay all costs to repeat start up or training procedures again with the Construction Manager/Owner's representative as witness.
7. In addition to specific training required in each specification sections, each contractor is required to provide (1) session of general usage and maintenance training for all equipment, systems or work installed on the Project once the equipment, systems, or work is complete and accepted by the Engineer/Owner.
   a. Contractor to prepare a written agenda for the Training sessions and provide training duration as required to review all agenda items. Submit Training Agenda for Architect Approval prior to scheduling training. The Contractor is to provide a sign-in sheet and video recording of session, Operation and Maintenance Manuals, and any other training documentation associated with training. Submit this Documentation with the Closeout Documents.
   b. Provide Serial Numbers of all equipment with Maintenance Manuals.
8. If Equipment or system(s) being turned over to the owner for use prior to 100% completion and acceptance due to schedule and the equipment/system(s) is still not complete and accepted by the Engineer, then the Contractor is to provide additional training upon equipment turn over to owner to allow partial use of equipment without depleting original training sessions or hours required by contract for completed equipment.

L. **TEMPORARY FACILITIES RESPONSIBILITIES – DESIGNATED RESPONSIBLE CONTRACTORS.**

All sections shall be provided as referenced within Part 3 Execution Section of "011500 – Temporary Facilities and Controls."

1. **Temporary Portable Chemical Toilet Facilities:** The **General Contractor** shall provide Temporary Portable Chemical Toilet Facilities for all construction personnel, Construction Manager, and all other Contractors.
2. **Dumpsters:**
   a. Dumpsters for work associated with the New Building are to be provided by the **General Contractor** for use by all Contractors working within the building (including other contractors providing work associated with Contract Drawings).
   b. The Contractor responsible for the **Site Work (Site Contractor)** shall provide disposal/removal/dumpsters for work associated with the **Site/Civil Work**.
3. **Temporary Electric Power Service**: The **Electrical Contractor** shall provide and maintain the Temporary Electric Power Service for: New Building, Staging Area, and (5) Contractor + (1) CM Trailer Connections.
   a. **Each Contractor** shall provide Generators as needed for their own work until the Temporary Electric Power Service is scheduled to be installed.
4. **Temporary Lighting Service**: The **Electrical Contractor** shall provide the Temporary Lighting Service for use by all contractors.
   a. See Staging Area and Logistic Plan for additional requirements.
5. **Temporary Water Service**: The **Plumbing Contractor** shall provide the Temporary Water Service for use by all contractors.
   a. Provide supply and refill of temporary potable water supply until final water service is scheduled to be installed.
   b. See Staging Area and Logistic Plan for additional requirements.
6. **Temporary Heating Service**: The **General Contractor** shall provide Temporary Heating Service for the New Building.
   a. See Milestone Schedule for Scheduling of Building Enclosure and Final Cleaning permitting use of permanent HVAC.
7. **Temporary Barricades and Building Signage:** The **General Contractor** shall provide Temporary Barricades.
   a. See Staging and Logistics Plan for additional requirements.
8. **Temporary Building Storm Drainage**: The **Plumbing Contractor** to provide Temporary Building Storm Drainage.
9. **Temporary Staging Area, Access Roads, Site Signage, and Site Fence:** The Contractor responsible for **Site Work (or Site Contractor)** shall provide Temporary Staging Area, Access Roads, and Site Fence for use by all contractors.
   a. See Staging and Logistics Plan for requirements.
10. **Building & Site Maintenance:**
    a. The Contractor responsible for **Site Work (Site Contractor)** shall be responsible for Maintaining Temporary Access Roads and Existing Roads.
    b. The **General Contractor** shall be responsible for Snow/Ice Removal at Building/Adjacent sidewalks.
11. **Temporary Fire Extinguishers for Building Construction:** The **General Contractor** shall provide Building Fire Extinguishers for Construction.

1.5 CONTRACT 1 - GENERAL CONSTRUCTION WORK: (Also referred to as: "General Contractor" or "GC")

A. The Work of the General Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as General Construction Work.

a. Drawings:
   1) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
   2) All "A" Series Drawings (Architectural) – Provide all work shown.
   3) All "S" Series Drawings (Structural) – Provide all work shown.
   4) All "C" Drawings (Civil) for details within Site/building delineation)
   5) For Coordination purposes:
      a) Review All "M" (Mechanical), "E" (Electrical), "P" (Plumbing), "FP" (Fire Protection), "FF" (Furniture), "TN" (Telecommunications), "TY" (Security), TA (Audio Visual) series drawings as it relates to the work of this contract.

b. Specifications:

   1) Division 0 –Procurement and Contracting Requirement, all Sections.
   2) Division 1 –General Requirements, all Sections,
      a) Provide Coordination / Coordination Drawing responsibilities indicated in 01 31 15 - Coordination Between Multiple Prime Contractors.
   3) Division 2 –Existing Conditions, all sections.
   4) Division 3 –Concrete, all Sections. (Per General Contractor/Site Contractor delineation)
   5) Division 4 – Masonry, all sections.
   6) Division 5 – Metals, all Sections.
   7) Division 6 – Woods and Plastics, all Sections.
   8) Division 7 – Thermal and Moisture Protection, all Sections.
   9) Division 8 – Openings, all Sections.
   10) Division 9 – Finishes, all Sections.
   11) Division 10 – Specialties, all sections except exclusions noted below.
      a) Excludes: 101453 – Traffic Signage, and 107500 – Flag Poles.
   12) Division 11 – Equipment: Includes **113100 Kitchen Appliances only.**
   13) Division 12 – Furniture, all sections except exclusions noted below.
      a) Excludes: 125000 Furniture Provided by Others, and 129300 – Site Furnishings.
   14) Division 31 – Earthwork - (Per General Contractor/Site Contractor delineation).
   15) Division 32 – Exterior Improvements (Per General Contractor/Site Contractor delineation).
   16) Division 33 – Utilities (Per General Contractor/Site Contractor delineation).

B. Coordination:
   1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
      a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
      b. Project Master Schedule development and submissions of 2-week look-ahead schedules.
      c. Final Cleaning Schedule.
      d. MEP work.
      e. Casework with other wall mounted items.
      f. Underground Utilities and Trench Locations.
      g. Blocking for Wall Mounted Equipment.
         1) Including AV Displays indicated on "TA" Drawings.
      h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
      i. Electrical Requirements and connections for Equipment.
      j. Access Door locations.
      k. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
      l. Door Hardware Material Prep and Coordination with Security Contractor.
      m. Temporary Enclosures and Building Access.
      n. Temporary Facilities for use by other Contractors.

C. Temporary Facilities
   1. Provide Temporary Facility responsibilities indicated in "011200 - Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
      a. Additional Requirements indicated in "011500 - Temporary Facilities and Controls."

D. Common General Construction Requirements:
   1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
   2. Access Doors
      a. Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor as required for maintenance, service, or code.
      b. Provide installation of Access Doors furnished by other contractors in new wall or ceiling construction.
      c. Include in base bid to furnish and install the following access doors beyond those already shown on drawings:
         1) (5) 18" x 18" fire-rated stainless steel access doors for either gypsum or masonry construction.
   3. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
   4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
      a. Includes Equipment Finishes and any other pre-painted finished items or devices prior to ordering of material.
   5. Provide blocking/reinforcement as needed for all wall/ceiling mounted items indicated on Contract Drawings.

E. Project Specific Requirements:
   1. Concrete Equipment Pads:
      a. **General Contractor** shall provide Concrete Pads for Plumbing Equipment in Water Room 157 as indicated on A-111. Plumbing Contractor to provide Layout.
      b. **General Contractor** shall provide Concrete Pads for Mechanical Equipment in Mechanical Room 156 as indicated on A-111. Mechanical Contractor to provide Layout.
      c. **General Contractor** shall provide Concrete Pads for Electrical Equipment in 154 and 155 as indicated on A-111, and Generator Transformer Equipment as indicated on A-060. Electrical Contractor to provide Layout.
   2. Provide inwall reinforcement/blocking as required for wall mounted displays indicated on "TA" Drawings.
   3. "Remedial Action Work Plan – Appendix C"
      a. The **Site Contractor** shall provide management and removal or relocation of layer of contaminated soils per "Remedial Action Work Plan – Appendix C".
      b. "Remedial Action Work Plan – Appendix C" Procedures and additional requirements for Contaminated Soils are **not** required by the **General Contractor**.
      c. The Site Contractor will provide removal of contaminated soils that overlap into the portion of the zone defined as: "The New Building and Generator/Energy Storage Enclosure locations + 5-foot zone from perimeter of foundations of locations".
         1) See Figure 6: Extent of Contamination in Soils Map and Drum Carcass Area within "Remedial Action Work Plan – Appendix C" for locations.

F. Identification and Labeling: Provide Labeling of all equipment.
   1. Equipment Labelling shall be sized to be visible from ground level.
   2. Provide complete schedules of the following items:
      a. Equipment Label Schedule with Equipment Model and Serial Numbers.
      b. Maintenance and Test Interval Schedule of all equipment.
      c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
         1) (Filters, Belts, Seals, Fluids, etc.)
   3. Provide additional labels for equipment above ceilings or behind an Access Door and install Labels on Ceiling or Access Door.

G. Electrical Wiring of Equipment and Devices:
   1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
      a. See "Electrified Door Hardware Wiring" Section of Electrical Contractor's Contract Summary for wiring supplied by **others** for Electrified Door Hardware.

H. Electrified Door Hardware Wiring:
   1. Electrified Door Hardware listed on Hardware Schedule to be furnished and mounted by the **General Contractor**.
      a. Line Voltage Power wiring to be provided by **Electrical Contractor** to Electrified Door Hardware or Door Hardware Equipment
      b. Low Voltage Control wiring for electrified hardware to be provided by **others**.
   2. The **General Contractor** is to provide start up, configuration, programing of all electrified door hardware and/or ADA Hardware equipment listed in Hardware Schedule/furnished under this Contract.
      a. If a portion of the Door Security System (Card Readers/Door Contacts) is being provided by **others**, then the Contractor providing that equipment shall provide start up, configuration, programing of these systems.

3. The **General Contractor** shall provide continuous internal raceways/pathways within new doors and frames for wiring all electric hardware or devices indicated on: Contract Documents or Hardware Schedule to an accessible location for future wiring (General Contractor to install Access Door if needed).
    a. The General Contractor shall provide pull string from all device locations to the accessible location.

I. **Site/Civil work Scope Delineation between General Contract (Contract #1) and Site Contractor (Contract #5): Civil/Site Work provided by <u>General Contractor (Contract #1)</u> indicated below:**

1. Site/Civil work "Scope Delineation Areas": The **New Building** and **Generator/Energy Storage Enclosure locations** + 5-foot zone from perimeter of foundations of locations are designated as responsible by: **General Contractor (Contract #1)**. All other Site/Civil work outside these areas is designated by **Site Contractor (Contract #5).**
2. Survey and Layout (per respective designated "<u>Scope Delineation Areas</u>"):
    a. Provide services of a licensed surveyor to provide layout required for all new work.
    b. For areas within new building footprints, provide field markings of: new building layout, column line layout, finished floor elevations, and as-built point of reference locations.
    c. Provide existing utility mark out of any existing utilities on site.
    d. Provide maintenance of surveyor layout and existing utility markings throughout the duration of the project and restore markings if disturbed during construction.
    e. Provide surveyed as-built locations and elevations of all underground utilities installed under this contract or excavated by this contract when utility install is by others, all to be recorded and supplied on CAD and PDF As-Built Drawings.
3. Earthwork: The **General Contractor** or **Site Contractor** (per their respective designated "<u>Scope Delineation Areas</u>") are to provide all site earthwork, excavation, bedding, backfill, subbase, and base material, including dewatering as required for the installation of work of this Contract:
    a. General Excavation: Excavations shall be in conformance with current OSHA regulations. Structure Excavation shall be made to the elevations, slopes and limits shown on the plans. Bottom of excavations shall be level and in firm, solid material; where soft or otherwise unsuitable material is encountered, such material shall be removed and replaced with properly compacted earth material, stone or flowable fill, as directed by the Architect or Construction Manager. Excavated material suitable for fill or backfill shall be stockpiled on the site to be turned over to **Site Contractor** for future use. Excess Material shall be properly disposed of by **Site Contractor.**
    b. Backfill: Provide specified backfill including when indicated Structural Fill under Building areas as indicated by Drawings and Specifications.
    c. Dewatering: An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the Architect or Construction Manager. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress.
        1) Dewatering shall remain in place until directed to be removed by the Construction Manager.
        2) Excavated areas shall be kept free of water during construction. Where necessary, excavations shall be protected by shoring, sheeting, cofferdams, or other suitable methods.
        3) The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation.

4) Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage and does not cause damage to any portion of the work or adjacent property.
5) All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage.
6) The dewatering system shall be maintained until backfilling is complete.
7) All damages resulting from the dewatering shall be repaired by the Contractor to the satisfaction of the Architect and at no cost to the Owner.

4. Utility Trench Excavation: For all underground utilities shown on any Contract Drawings, the **General Contractor** or **Site Contractor** (per their respective designated "Scope Delineation Areas") are to provide: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
   a. Provide for the following utilities:
      1) All underground Electrical/Telecom/Data/Fiber utilities and conduits shown on Electric/Civil/Telecommunications/Security Drawings.
      2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
      3) Floor boxes and associated conduits indicated on Electrical Drawings.
      4) Domestic Water Supply indicated on Plumbing/Civil Drawings.
      5) Sanitary/Sewer indicated on Plumbing/Civil Drawings.
      6) Sprinkler Piping indicated on Fire Protection/Civil Drawings
      7) Storm/Sump/Footing Drain indicated on Plumbing/Civil Drawings.
      8) Geothermal Piping indicated on Mechanical/Civil Drawings.
      9) Underground Refrigerant piping indicated on Mechanical Drawings.
   b. **General Contractor** is to provide any foundation footing drains indicated on Architectural Drawings at the foundation, and Site Contractor to provide footing drain piping from 5 feet outside building perimeter.
5. Site Demolition: The **Site Contractor** is to provide **all** demolition as indicated on Civil Drawings, including within areas designated as responsibility by **General Contractor within "Scope Delineation Areas"**. Including Removing Existing Vegetation, Clearing and Grubbing, Stripping and Stockpiling Topsoil (Topsoil to be turned over to the **Site Contractor)**, removal of existing above/below grade site features and improvements and backfill after removal, removal of existing utilities and backfill after removal, and all other demolition indicated on Civil Demolition Drawings.
6. Site Landscaping: Landscaping, Topsoil, Turfs and Grasses, Plantings, Restoration, shall be provided by the **Site Contractor** as indicated on Civil Drawings including within areas designated as responsibility by **General Contractor within "Scope Delineation Areas"**.
7. Site Concrete:
   a. The **General Contractor** will provide all foundation walls, retaining walls, and staircases (including landings at each end of the staircase) as specifically indicated in Structural Drawings, even if depicted on exterior of building. Sidewalks or Slabs within these retaining walls, foundation walls, or staircase landings shall be provided by the **General Contractor**.
   b. The **General Contractor** shall provide the first exterior concrete landing or sidewalk panels outside of all exterior doors to the first exterior expansion or control joint.
      1) Expansion Joints between interior and exterior slabs at doorways shall transition under each building exterior door transition or threshold.

c. **Site Contractor** to provide all concrete stairs, sidewalks, slabs, pads, retaining walls, and other concrete features/concrete work indicated on Civil Drawings that are not specifically indicated to be provided by General Contractor or Others.
d. Provide shop drawings for all concrete work including field measurements and elevations of any existing connection locations prior to installation. General Contractor and Site Contractor shall coordinate concrete transitions prior to performing any concrete work.
e. Each Contractor is to provide their own concrete wash out areas and restoration as required for their own work.

J. Concrete and Masonry:
1. Provide interior equipment pads when indicated on Architectural or Structural Contract Drawings.
2. Provide all concrete and masonry work indicated on structural/Architectural Drawings. Coordinate with all other Contractors for openings and penetrations.
3. Install concrete and masonry sleeves as provided and marked out by other contractors prior to new concrete/masonry construction.
4. Loose Masonry lintels are furnished, installed, and grouted by General Work Contractor for openings required for their own work and openings required by other Prime Contractors for work shown on other Contract Drawings.
5. Provide frost protection during excavation; protect concrete slab and masonry from cold temperatures during and after pour.

K. Metals:
1. Provide all steel beams / columns and associated lintels at new openings as shown.
2. Install miscellaneous metal fabrications furnished by other contractors but scheduled to be installed under the General Construction Contract as shown and/or specified in the contract documents.

L. Louvers:
1. Furnish and install Louvers indicated in new window/curtainwall systems only and were indicated on Architectural Drawings. All other louvers not specifically indicated to be provided on Architectural Drawings are to be provided and installed by others.

M. Roofing:
1. Provide all roofing work for new building. Roof blocking and plywood, including:
2. For cutting holes through new deck, the following shall apply:
a. Temporary and final roofing and weather-tight protection for roof at new building shall be by the General Construction Contractor.
b. Flashing and counter flashing for all penetrations.
3. On Flat Roofs, provide roof walkway pads entirely around roof mounted mechanical equipment even if not indicated on Roofing/Architectural Drawings.

N. Doors, Frames, and Hardware:
1. The GC is required field verify and measure all existing conditions and openings prior to ordering Door/Frame/Hardware material. The GC is to coordinate hardware selections to confirm there are no interference between selected hardware and/or recessed/morticed hardware prep or glazing in doors. The GC is to coordinate and confirm there will be no conflicts between glazing, closers, overhead stops, coordinators, door holders,
2. The GC is required to verify closer type/configuration/mounting position submitted is coordinated with installation conditions and includes sufficient swing radius for electromagnetic door holders, or closer stop position where wall stop will not properly stop door and overhead stop is not included in hardware schedule. Coordinate with adjacent wall conditions. Provide blocking at all Door Wall Stops.

3. The GC is to provide adjustment of Door Hardware until all hardware functions properly and accepted by the Owner/Architect.

O. Finishes: Provide all finishes indicated in Division 9. Review existing conditions and confirm acceptable substrates prior to installing new finishes.
1. Provide self-leveling underlayment where required to allow for an acceptable flooring installation.
2. If conditions/substrates are not acceptable for finish work installation, notify the Construction Manager/Architect and/or submit an RFI requesting direction if further action is needed. Do not install finishes if existing conditions are not acceptable per manufacturers requirements.

P. **Furniture Scope of work between Furniture Contractor, General Contractor, Electrical Contractor, and Owner:**
1. **Furniture Contractor** to provide: Shop Drawings, Coordination Drawings, and Product Submittals to **Electrical Contractor** for all work relating to the electrical or low voltage scope of the Furniture Work.
    a. **Furniture Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors for Fire Alarm and Security work.
2. **Furniture Contractor** to provide all Furniture indicated as by "XYBIX" on "FF" Drawings.
3. **Owner** to provide all Furniture indicated as by "OWNER" on FF Drawings.
4. **General Contractor** to provide all other Casework, Cabinets, and Furniture indicated on Architectural Drawings.
    a. See items tagged as "Y" under GC on Architectural "A" Elevation Drawings for additional information.
5. **Furniture Contractor** to provide Internal Connection Hub for Electrical Contractor to Terminate Telecommunications wiring to with exception to data lines shown to run directly to devices on furniture.
    a. Furniture Contractor to review "TA" Drawings for Audio-Visual Devices.
    b. Furniture Contractor to review "TN" Drawings for Telecommunications Wiring.
6. **Electrical Contractor** to provide Data/Telecommunications wiring for connection to Furniture Communication Hub(s) as shown on Electrical/Furniture Drawings.
7. **Electrical Contractor** to provide outlets mounted in "XYBIX Furniture" and wiring from Floor Boxes outlets to outlets Mounted in "XYBIX" Furniture as shown on Electrical Drawings.
8. **Furniture Contractor** to exclude all work specifically provided by **Other Contractors.**
9. **General Contractor** to exclude all work specifically provided by **Furniture Contractor.**

Q. Provide owner training of systems installed. In addition to Training required by other spec sections, provide at minimum the following training upon equipment/system completion and acceptance (per 018200 Demonstration Training Specification):
1. Door Hardware Training.
2. Maintenance of Roof Training.
3. Finish Training for Maintenance of all installed finishes.
4. Residential Appliances

1.6 CONTRACT 2 -MECHANICAL CONSTRUCTION WORK: (Also referred to as: "Mechanical Contractor" or "MC")

A. The Work of the Mechanical Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Heating, ventilating, cooling, and controls work.

a. Drawings:
   1) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
   2) All "M" Mechanical Series Drawings – Provide all work.
   3) For Coordination purposes:
      a) Review All "A" (Architectural), "S" Structural, "C" (Civil), "E" (Electrical), "P" (Plumbing), "FF" (Furniture), "FP" (Fire Protection), "TN" (Telecommunications), "TY" (Security), "TA" (Audio Visual) series drawings as it relates to the work of this contract.

b. Specifications:

   1) Division 0 –Procurement and Contracting Requirement, all sections.
   2) Division 1 –General Requirements all sections.
   3) Division 2 – Section 024119, Selective Structure Demolition.
   4) Division 7 – Sections relating to: Penetration / Joint Firestopping and Joint Sealants, as required for the Work of this Contract.
   5) Division 8 – Access Doors as required.
   6) Division 23 – HVAC, all sections.
   7) Division 25 – Integrated Automation, all sections
   8) Division 26 - All sections as they relate to this contract for power connections to equipment.

B. Coordination:
1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
   a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
   b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
   c. Final Cleaning Schedule.
   d. MEP work.
   e. Blocking for Wall Mounted Equipment.
   f. Casework with other wall mounted items.
   g. Underground Utilities and Trench Locations.
   h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
   i. Electrical Requirements and connections for Equipment.
   j. Access Door locations.
   k. Temporary Enclosures and Building Access.
   l. Temporary Facilities for use by other Contractors.

C. Temporary Facilities

1. Provide Temporary Facility responsibilities indicated in "011200 - Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
    a. Additional Requirements indicated in "011500 - Temporary Facilities and Controls."

D. Common Mechanical requirements:
1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
2. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by **General Contractor** as required for maintenance, service, or code.
3. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
    a. Includes Equipment Finishes and any other pre-painted finished items or devices prior to ordering of material.
5. Furnish motor controllers, equipment disconnects, and variable frequency drives to Electrical Contract for installation and wiring where not indicated on Electrical Drawings.
6. Furnish HVAC equipment roof supports, curbs, and pipe portals.
7. Provide insulation of all modified piping, ductwork, and equipment.
8. Provide complete finished installation of equipment, duct work, metal chases with all paint as needed to provide a complete finished system. Provide Duct painting of all exposed ductwork not covered by a ceiling unless indicated painting of exposed ceiling system / mechanical systems by **General Contractor** per Architectural Drawings / Architectural Finish Schedule.
9. Provide additional isolation valves as needed for contractor's convenience or as needed to maintain project schedule via means and methods.
10. For Equipment provided with Packaged Controls, provide Equipment devices and accessories to all the Controls Contractor (or Subcontractor) the ability to perform complete integration of Equipment's functions into Building Management System.
    a. Provide Package Controls Integration Control Points and Equipment Sequence of Operations to Engineer as Submittal for Engineer approval prior to ordering equipment.
11. Filters: Provide at minimum: (1) replacement set of filters for all equipment to be turned over to the owner with equipment filter schedule that includes all information/sizes/models/quantities needed for the owner to purchase new filters for all equipment.
    a. Provide replacement filters for any equipment that ran during construction. Provide duct cleaning for any ductwork utilized during construction as needed.

E. Project Specific Requirements:
1. Concrete Equipment Pads:
    a. General Contractor shall provide Concrete Pads for Mechanical Equipment in Mechanical Room 156 as indicated on A-111. Mechanical Contractor to provide Layout. All other Mechanical Pads by Mechanical Contractor.

F. Identification and Labeling: Provide Labeling of all piping, duct work, equipment, valves, control valves, dampers, junction boxes, panels, electrical devices, and electrical connections.
1. For electrical connection labelling: Indicate Panel and Circuit of all electrical devices, outlets, or other power connections for all equipment.

2. Equipment, Piping, Control Valve, and Duct Labelling shall be sized to be visible from ground level.
3. Provide complete schedules of the following items:
   a. Equipment Label Schedule with Equipment Model and Serial Numbers.
   b. Maintenance and Test Interval Schedule of all equipment.
   c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
      1) (Filters, Belts, Seals, Fluids, etc.)
   d. Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function)
   e. Panel Schedules for all new or modified Electrical/Control Panels by this Contract.
4. Provide additional labels for valves, dampers, devices, or equipment above Ceilings or behind an Access Door, and install Labels on Ceiling or Access Door.

G. Electrical Wiring of Equipment and Devices:
1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.

H. **Controls by Mechanical Contractor: Mechanical Contractor** to provide complete Building Management System Controls per **230923 (Direct Digital Control System and Sequence of Operations for HVAC Controls)**.
1. Acceptable Controls Supplier/Manufacturer: Automated Logic (Eastern Heating & Cooling) or Approved Equal.
2. Mechanical Contractor to install all Control Valves and Automatic Dampers provided by the Controls Contractor (Subcontracted to Mechanical Contractor). Provide pipe and duct fittings for controls sensors and other controls items as required.
3. Provide all electrical work required for Controls Systems in compliance with respective sections of Division 26/27 – Electrical/Communication for wiring, cables, boxes, conduits, breakers, thermostats, identification.

I. Commissioning: Provide onsite commissioning assistance all other responsibility required by Mechanical Contractor and Controls Contractor indicated in **230800 Commissioning by Owner – HVAC Systems.**

J. Testing, Adjusting, and Balancing: Provide Testing, Adjusting, balancing of all new HVAC systems to be included in this contract per **230594 Balancing of Systems**.

K. Provide owner training of systems installed. In addition to Training required by other spec sections, provide at minimum the following training upon equipment/system completion and acceptance (per 018200 Demonstration Training Specification):
1. Controls Training – Minimum 3 sessions to be completed within 1 year of Controls system final acceptance.
2. Mechanical Room with overview of Geothermal Well System.
3. Energy Recovery Units (w/ Humidifiers).
4. Pumps.
5. Water to Water Heat Pumps.
6. Water Source Heat Pumps.
7. Overall Piping and Valve locations within new building.

L. Geothermal work:
   a. All Geothermal work outside building foundation and branch piping penetrating through foundation (with caps and sufficient piping length for connection by Mechanical Contractor) to be provided by **Site Contractor.**
   b. **Site Contractor** to provide all pressure testing, flushing, and all other quality control requirements for piping installed by Site Contractor after Mechanical contractor has connected piping manifold.
   c. **Mechanical Contractor** to provide Pipe Manifold, connections to branch piping, provide piping specialties, valves, balance valves, additional valves for testing purposes of the geothermal system, foundation sleeves (see structural drawings), insulation, Fernco fittings, and all other piping accessories/connections shown on manifold detail section on M-401 and as needed for a complete balanced well system.
      1) **Mechanical Contractor** to provide final filling of fluid for the entire geothermal well system.
   d. **Site Contractor** to include handling and management of drill slurry/fluid to treated and managed to be reused onsite for proper compaction within landscape areas.
   e. See section in Summary of Work for "Geothermal Installation Sequence and Coordination".
   f. Provide written documentation of coordination of entire installation process, shop drawings, and products between Mechanical Contractor, General Contractor (for foundation penetration locations) and Site Contractor to be submitted to Construction Manager/Architect prior to start of all work.

M. Geothermal Installation Sequence and Coordination:
   1. Specific scope associated with Work at Geothermal Wells – This method appears to be the industry standard for Geothermal Well installation. If upon coordination of the entire Project Team, including the Architect, Construction Manager, Owner and all Prime Contractors, a more efficient and more practiced construction method exists, and does not incur any additional costs to any member of the Project Team; it may be submitted to the Construction Manager for review and approval prior to start of activity.
      a. Sequence:
         1) Site Contractor establishes benchmark and offset elevations including locating all wells.
         2) Site Construction Work Contractor installs all necessary site work management controls including all necessary erosion / wastewater controls.
         3) Site Contractor performs all removals and topsoil stockpiling.
         4) Site Contractor shall also remove top layer of contaminated Soils as indicated in Remedial Action Work Plan Appendix C of Specifications.
         5) Site Contractor excavates trench from all well areas to the manifold structure within the building through foundation.
         6) Geothermal Wells Contractor (under Site Contractor) drills geothermal wells.
         7) Site Contractor removes Well Drilling Fluid/Slurry per in Remedial Action Work Plan Appendix C of Specifications.
         8) Site Contractor installs all precast concrete structures and underground utilities, including light poles, storm water basins, and underground piping and conduits.
         9) Geothermal Wells Contractor (under Site Contractor) installs all piping loops, well casing and well grouting after all other nearby utilities are installed to avoid damage.
         10) Geothermal Wells Contractor (under Site Contractor) installs piping from wells to manifold structure location within the building footprint capped and prepared for connection by Mechanical Contractor.

a) Geothermal Wells Contractor (under Site Contractor) to allow time for building construction to proceed for Construction of Mechanical Room and Piping Manifolds prior to return to site.

11) Mechanical Contractor to install Piping Manifolds and Accessories.
12) Geothermal Wells Contractor (under Site Contractor) performs pressure test and flushing procedures on all piping and caps lines as necessary.
13) Site Construction Work Contractor backfills all well piping in bedding material as specified.
14) Site Contractor backfills all areas necessary to install remainder of Site Contractors Work according to specifications. Well pipes to remain pressurized until backfilling is complete. If pipes are damaged during backfilling operations, they are to be repaired immediately and re-pressurized.
15) Geothermal Wells Contractor (under Site Contractor) Flushes Geothermal System.
16) Mechanical Contractor to provide geothermal energy recovery piping from Manifold.
17) Site Contractor to backfills and compact trench with detectable warning tape from building to all wells.

1.7 CONTRACT 3 - ELECTRICAL CONSTRUCTION WORK: (Also referred to as: "Electrical Contractor" or "EC")

A. The Work of the Electrical Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Electrical Construction work.

a. Drawings:
   1) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
   2) All "E" Electrical Series Drawings – Provide all work.
   3) Electrical Work Scoped under Electrical Contract within "TN" (Telecommunications), "TY" (Security), "TA" (Audio Visual) series Drawings except for work specifically indicated to be provided by **Fire Alarm and Security Contractor or Audio-Visual Contractor**, which is to be excluded from the **Electrical Contract.**
   4) "C" Civil Drawings – For Dosing Tank Power and Control Wiring shown on C-511.
   5) "FF" Furniture Drawings: for Electrical Connections to Furniture.
   6) For Coordination purposes:
      a) Review All "A" (Architectural), "S" Structural, "C" (Civil), "M" (Mechanical), "P" (Plumbing), "FF" (Furniture), "FP" (Fire Protection), series drawings as it relates to the work of this contract.

b. Specifications:

   1) Division 0 –Procurement and Contracting Requirement, all Sections.
   2) Division 1 –General Requirements all Sections.
   3) Division 2 – Section 024119, Selective Demolition.
   4) Division 7 – Sections 078413 & 078443, Penetration & joint Firestopping as required for the Work of this Contract.
   5) Division 8 – Access Doors as needed.
   6) Division 9 – As needed for Electrified Hardware.
   7) Division 11 - 111136 - Vehicle Charging Equipment.
   8) Division 23 - All sections as relates to this contract for power connections to equipment.
   9) Division 26 – Electrical, all sections.
   10) Division 27 – Communications, all sections except as excluded below:
      a) See work scoped under **Audio Visual Contractor (AVC)** for Spec Sections 274116 Audiovisual Systems for exclusions.
   11) Division 28 – See below for exclusions:
      a) See Security & Fire Alarm Electrical Work Scoped under Electrical Contract per **Electrical Contractor**, see work scoped under **Fire Alarm and Security Contractor (FSC)** for exclusions.

B. Coordination:
1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:

a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
c. Final Cleaning Schedule.
d. MEP work.
e. Blocking for Wall Mounted Equipment.
f. Casework with other wall mounted items.
g. Underground Utilities and Trench Locations.
h. Blocking for Wall Mounted Equipment Including AV Displays indicated on "TA" Drawings.
i. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
j. Electrical Requirements and connections for Equipment.
k. Access Door locations.
l. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
m. Temporary Enclosures and Building Access.
n. Temporary Facilities for use by other Contractors.

C. Temporary Facilities
1. Provide Temporary Facility responsibilities indicated in "011200 - Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
a. Additional Requirements indicated in "011500 - Temporary Facilities and Controls."

D. Common Electrical Requirements:
1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
2. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by **General Contractor** as required for maintenance, service, or code.
3. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
a. Includes Equipment Finishes, cover plates, exposed conduits/wire mold, and any other pre-painted finished items or devices prior to ordering of material.
5. See Architectural Elevations for additional information for locations of wall mounted devices.
6. Provide all power wiring to all HVAC equipment.
a. (Install motor controllers or disconnects supplied by Mechanical Contractor when motor controllers or disconnects are not indicated on Electrical Drawings).

E. Project Specific Requirements:
1. Concrete Equipment Pads:
a. **General Contractor** shall provide Concrete Pads for Electrical Equipment in 154 and 155 as indicated on A-111, and Generator Transformer Equipment as indicated on A-060. Electrical Contractor to provide Layout. All other Electrical Pads by Electrical Contractor.
b. Concrete Transformer Vaults/Pads to be furnished by **Electrical Contractor** and set by **Site Contractor.**
2. Upon installation of Server/AV Racks, provide temporary air purification/air cleaning system in Server Room 152 and AV Room 151 to capture dust from construction to be

removed when Contractor Construction is completed. Provide Plastic Protection sealing Server/AV racks from dust during construction.

3. Provide Site Dosing Tank Control/Power Wiring and Device install by Electrical Contractor. Site Contractor to furnish Devices, Control Panel, Pumps, and Accessories for install by electrician. Control Panel Support and Enclosure to be installed by Site Contractor.
4. Provide Generator System. (Indicated in 263214 – Packaged Engine Generator System). Includes Generator Portable Work Platform on E-003.
5. Portable Generator indicated as "Not in Contract" on E401 shall be provided by Owner. Electrical Contract (Contract #3) shall provide Portable Generator Connection Box and Accessories as shown on Electrical Drawings.
6. Provide Battery Energy Storage System. (Indicated in Section 263317 – Battery Energy Storage System.
7. Provide complete Photovoltaic/Solar System. Indicated in 263100 Photovoltaic System and as shown on Electrical (E) Drawings.
8. See Civil Drawings for additional Light Pole Base/Camera Pole Base Details.
9. Provide complete grounding system at building and site as shown on Electrical Drawings and defined in 260451 – Building Grounding System.

F. Identification and Labeling: Provide Labeling of all equipment, junction boxes, panels, electrical devices, and electrical connections.
   1. For electrical connection labelling: Indicate Panel and Circuit of all electrical devices, outlets, or other power connections for all equipment.
   2. Equipment Labelling shall be sized to be visible from ground level.
   3. Provide complete schedules of the following items:
      a. Equipment Label Schedule with Equipment Model and Serial Numbers.
      b. Maintenance and Test Interval Schedule of all equipment.
      c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
         1) (Filters, Belts, Seals, Fluids, etc.)
      d. Panel Schedules for all new or modified Electrical/Control Panels by this Contract.
   4. Provide additional labels for equipment above Ceilings or behind an Access Door and install Labels on Ceiling or Access Door.

G. Electrical Wiring of Equipment and Devices:
   1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.

H. Electrified Door Hardware Wiring:
   1. Electrified Door Hardware listed on Hardware Schedule is to be furnished and mounted by the **General Contractor**.
      a. Line Voltage Power wiring to be provided by **Electrical Contractor** to Electrified Door Hardware or Door Hardware Equipment
      b. Low Voltage Control wiring for electrified hardware to be provided as indicated in:
         1) "Fire Alarm and Security Scope of work between Electrical Contractor Fire Alarm and Security Contractor".
   2. The **General Contractor** is to provide start up, configuration, programing of all electrified door hardware and/or ADA Hardware equipment listed in Hardware Schedule/furnished under this Contract.
      a. If a portion of the Door Security System (Card Readers/Door Contacts) is being provided by **others**, then the Contractor providing that equipment shall provide start up, configuration, programing of these systems.

3. The **General Contractor** shall provide continuous internal raceways/pathways within new doors and frames for wiring all electric hardware or devices indicated on: Contract Documents or Hardware Schedule to an accessible location for future wiring (General Contractor to install Access Door if needed).
    a. The General Contractor shall provide pull string from all device locations to the accessible location.

I. Electric Service:
1. Provide complete Electric Service as indicated on Electrical Drawings.

J. Telecommunications and Data Systems:
1. Provide All Building Interior Data Wiring, to be tested and terminated as shown on TN Drawings from Data Locations indicated on Plans/Server Room/AV Room.
2. Provide Site Data/Fiber as indicated on Site TN Drawings.
3. PoE Switch to be provided by Owner at Microwave Tower. Electrical Contractor to provide Fiber from IT Racks to PoE Switch, and device wire from PoE Switch to Site Devices: all as indicated on TN-100.
4. Provide Data Wiring to connect to Camera's installed Owner Security Contractor as indicated on TY Drawings.
5. Provide Site Fiber and Data as indicated on Telecommunication Site.
6. Provide Fire Alarm Panel Data Lines as indicated on E501.
7. Electrical to provide and install empty server racks per 271116 – Cabinets and Racks. Equipment and Devices within Server Rack to be provided and installed by Owner.
8. Provide all electrical power and data floor boxes as shown on Electrical Drawings. See Electrical Details for Floor Box Types.
9. For Floor boxes serving Furniture indicated on FF (Furniture Drawings) locations are to be coordinated and confirmed with Furniture Contractor for Data and Power Connections.
10. Provide Unitary Power Supply and UPS Floor Support System in Server Room, provide all work indicated in 263354 – Unitary Power Supply.
11. Provide all Commissioning Responsibilities as indicated 270800 Commissioning of Communications Systems for Communications work installed under the Electrical Contract.

K. **Audio Visual System:**
1. Owner to provide Audio Visual System via **Audio Visual Contractor (AVC)** who is to provide equipment, devices, programming, and commissioning. **Electrical Contractor** to providing wiring in building and support work for **Audio Visual Contractor (AVC)** as indicated below**.**
2. **Electrical Contractor** to provide as indicated on TA/TN Drawings:
    a. Shop Drawings, Coordination Drawings, and Product Submittals to Audiovisual Contractor for all work relating to the Audio-visual Scope that includes model numbers and layout locations on elevations and floor plans.
        1) Utilize Architectural Elevations for layout, coordinate with general notes on TA Drawings regarding placement of Displays and Speakers to be centered with respect to furniture or tables. Provide Submittal.
        2) **Electrical Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors.
    b. Data Wiring for terminated, tested, and labelled on both ends: data lines from AV Room 151 to all locations requiring AV Data Lines as indicated on **TN or TA Drawings**.
    c. Power outlets for all displays as indicated on TA Drawings.
    d. AV Racks in AV Room 151 as specified in 271116 – Cabinets and Racks.

e. Speaker Wires shown on TA-803- "Other Rack Devices" Detail: Cables from AV Racks in AV Room 151 to locations indicated on TA/TN Drawings:
   1) **Electrical Contractor** to furnish and install Ceiling Speakers indicated on TA Drawings Tagged as Items: "5-1".
   2) **Electrical Contractor** to figure product: "Manufacturer: QSC, Model: AD-C6T-LP" for speakers. Confirm product via submittal process during construction.

f. At Audio video Touch Panel locations, **Electrical Contractor** to provide data lines as indicated on TA-801, TA-802, TA-803
   1) For Tabletop Touch Panels, Electrical Contractor to provide data lines from AV Rack in Room 151 to Touch Panel location via floor box with sufficient length to reach Table Touch Panel as coordinated by Audio Visual and Furniture Contractor.
   2) For Wall Mounted Touch Panels, Electrical Contractor to provide data lines from AV Rack in Room 151 to touch panel location via conduit, back box, and fire stopped conduit stub above ceiling. Coordinate Surface mount vs recessed back box type via submittal process and coordination with **Audio Visual Contractor (AVC).**

g. **Electrical Contractor** to furnish and install In Wall Back Boxes for all displays indicated on TA Drawings. Coordinate with General Contractor for blocking Locations.
   1) Item Tags indicated on TA Drawings as P501, P526, P527 are to reference In Wall Back Boxes for Flat Panel Displays.
   2) Provide all junction boxes, fire stopped conduits, and back boxes indicated on TA Drawings.

h. Floor box Types serving AV Equipment to follow details on Electrical "E" Drawings for Floor Box types.

i. **Electrical Contractor** to provide Power Bus Duct as indicated on Detail 7 – E604 and as noted on TN-601 Detail 2 for power to AV rack devices. All other power cords from Bus Duct on E604 Detail 7 to devices to be provided by Audio Visual Contractor.

j. Exclude All work specifically indicated to be provided by **Audio Visual Contractor (AVC)** Scope.

k. **Audio Video Contractor (AVC)** to provide:
   1) Furnishment and Installation of Displays, Display Mounts, Video Walls, Video Bars, Sound Bars, Encoders, Decoders, Video DA's, Touch Panels, AV Rack Devices, local Power Supplies, local wiring at: (displays, encoders, monitors, video bars, soundbars, and video walls), and all local wiring and patch cabling within AV Room 151.
   2) Office Monitors to be provided by Owner.
      a) Connection and wiring of Owner provided Monitors to Audio Visual System by **Audio Visual Contractor.**
   3) Exclude all work specifically indicated to be provided by **Electrical Contractor (Contract #3).**
   4) Provide any other devices, equipment shown on TA Drawings or required per 274116 – Audio Visual Systems Specification Section (except as excluded by Electrical Contractor) or any other devices and equipment required to provide a complete and functioning system shall be provided by **Audio visual Contractor (AVC).**
   5) Provide all items indicated within 274116 – Audio Visual Systems Specification except as excluded and to be provided by **Electrical Contractor (Contract #3).**
   6) **Audiovisual Contractor (AVC)** to provide Start Up, Functional Testing, and Commissioning reports of all equipment and software: to be submitted as written reports.
      a) Include Electrical Contractor's Approved Test Reports for Data Cables with final commissioning report.

L. **Furniture Scope of work between Furniture Contractor, General Contractor, Electrical Contractor, and Owner:**
   1. **Furniture Contractor** to provide: Shop Drawings, Coordination Drawings, and Product Submittals to **Electrical Contractor** for all work relating to the electrical or low voltage scope of the Furniture Work.
      a. **Furniture Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors for Fire Alarm and Security work.
   2. **Furniture Contractor** to provide all Furniture indicated as by "XYBIX" on "FF" Drawings.
   3. **Owner** to provide all Furniture indicated as by "OWNER" on FF Drawings.
   4. **General Contractor** to provide all other Casework, Cabinets, and Furniture indicated on Architectural Drawings.
      a. See items tagged as "Y" under GC on Architectural "A" Elevation Drawings for additional information.
   5. **Furniture Contractor** to provide Internal Connection Hub for Electrical Contractor to Terminate Telecommunications wiring to with exception to data lines shown to run directly to devices on furniture.
      a. Furniture Contractor to review "TA" Drawings for Audio-Visual Devices.
      b. Furniture Contractor to review "TN" Drawings for Telecommunications Wiring.
   6. **Electrical Contractor** to provide Data/Telecommunications wiring for connection to Furniture Communication Hub(s) as shown on Electrical/Furniture Drawings.
   7. **Electrical Contractor** to provide outlets mounted in "XYBIX Furniture" and wiring from Floor Boxes outlets to outlets Mounted in "XYBIX" Furniture as shown on Electrical Drawings.
   8. **Furniture Contractor** to exclude all work specifically provided by **Other Contractors.**
   9. **General Contractor** to exclude all work specifically provided by **Furniture Contractor.**

M. **Fire Alarm and Security Scope of work between Electrical Contractor Fire Alarm and Security Contractor:**

1. Electrical Contractor to provide: Shop Drawings, Coordination Drawings, and Product Submittals to **Fire Alarm and Security Contractor** for all work relating to the Fire Alarm Scope that includes model numbers and layout locations on elevations and floor plans.
   a. **Electrical Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors for Fire Alarm and Security work.
   b. See 283100 - Addressable Fire Alarm for information on conduit requirements.
2. Fire Alarm and Security Wiring:
   a. **Fire Alarm and Security Contractor** to provide all wiring required for devices of the Fire Alarm System. Wiring to be installed prior to Ceiling Installation.
   b. Fire Alarm Wiring to HVAC Equipment to be provided by Fire Alarm Contractor.
   c. For the Security System: **Electrical Contractor** shall provide terminated, tested, and labelled: CAT6A & 18/4 Cable with sufficient length to all doors indicated with Electric Strike or Card Reader per TY-201 – Security Floor Plan, and TY-701 - Security Details.
   d. **At Automatic Operator/Opener Locations Only: Electrical Contractor** to provide control wiring and conduits for ADA Automatic Operators/Openers and any associated Electrified Hardware, Push Buttons, Electrified Panic Bars or Electrified Strikes. Connection to Security System for Card Reader Access to be connected by **Fire Alarm and Security Contractor** after ADA operator is commissioned.
   e. Any additional local wiring for doors/electric strikes/locksets/card readers, request to exit motion sensors to be provided and installed by **Fire Alarm and Security Contractor (FSC)** to provide a complete and functioning system per design.
   f. **Electrical Contractor** to provide Site Fiber Indicated on **TN-100.**
   g. All local wiring and connection to Equipment or racks in IT Room to be provided by **Fire Alarm and Security Contractor**.
   h. **Fire Alarm and Security Contractor** to provide all wiring for Emergency Call Stations including site wiring in site conduits. Utilize **Electrical Contractor** provided underground conduits indicated on Electrical Drawings.
   i. **Fire Alarm and Security Contractor** to provide all other wiring required for a complete system for wiring that is not specifically indicated as to be provided by **Electrical Contractor.**
3. Conduits and Support for Wiring:
   a. **Electrical Contractor** to provide for all **wall mounted** Fire Alarm and Security devices:
      1) Proper Device Back-box, Conduit ran to above ceiling height, stubbed for future wiring by Fire Alarm and Security Contractor.
      2) Coordinate with **General Contractor** for wall mounted devices to be installed recessed in Concrete, Masonry, or ICF Walls.
      3) **Electrical Contractor** to provide firestopping/sealing around the exterior of all conduits and sleeves installed.
      4) **Fire Alarm and Security Contractor** to provide firestopping/sealing of interior of conduit/sleeve after wiring has been installed**.**
      5) **Fire Alarm and Security Contractor** to provide Acoustic Sealant of all Fire Alarm and Security device back boxes.
   b. **Electrical Contractor** to provide fire-stopped/sealed sleeves in sufficient size and quantity to all partitions or walls to allow fire alarm wiring to terminate to all devices in all rooms within the building.
   c. **Electrical contractor** shall provide all conduits shown on TY-701 Security Details for all devices including but not limited to: Card Readers, Door Contacts, Request

to Exit Motion Sensors, Power Transfer Hinges, and Junction Boxes. Install Pull String through all conduits.

1) **Electrical Contractor** to review Door and Hardware Schedule indicate on A-911 Door Schedule and Specification Section 080671 Door Hardware Schedule to coordinate their own work.

d. Open Cable shall be allowed above ceilings and in "attics". "Open to Structure" Ceilings shall require conduits and back boxes by electrical Contractor.
   1) See A801 Reflected Ceiling Plan for Ceiling Type information.
   2) See 283100 - Addressable Fire Alarm for information on conduit requirements.

e. Devices mounted in Ceilings are to be wired and installed with proper back boxes and device support by:
   1) **Fire Alarm and Security Contractor** proper Ceiling device back box after ceiling framing or grid is installed.
   2) **Fire Alarm and Security Contractor** to install Ceiling Devices after ceiling tile install, cut drop ceiling tiles as needed for devices if required.

f. Site Conduits for Site Cameras shall be provided by Electrical Contractor.

4. Devices:
   a. The **General Contractor** shall provide and install/mount all electrified Hardware indicated within "080671" – "Door Hardware Schedule". Excludes Card/Fob Readers which are to be provided by Fire Alarm and Security Contractor.
   b. **Fire Alarm and Security Contractor** to provide and install all Fire Alarm and Security Devices indicated on Contract Drawings and connect to any wiring provided by Electrical Contractor.
      1) Fire Alarm devices include: All devices shown on E-301, and any other devices, relays, and accessories required for a fully functioning system to meet design requirements.
      2) Security Devices Include: All devices shown on TY Drawings with exclusion to electrified hardware indicated in "080671" – "Door Hardware Schedule" which is to be **excluded from the Fire Alarm and Security Contractor** and provided by **General Contractor**. Provide any other devices, equipment and accessories required for a fully functioning system to meet design requirements.
         a) **The Fire Alarm and Security Contractor** is to provide "**ACM**" Access Control Modules at Door Locations.
         b) **Site Emergency Call Stations** to be provided in their entirety by Fire Alarm and Security Contractor.
5. **Electrical Contractor** to provide power to Fire Alarm Control Panel and sufficient conduits from Fire Alarm Control Panel to above ceiling to support all fire alarm wiring. All other work and materials for the Installation of the Fire Alarm Control Panel Shall be by **Fire Alarm and Security Contractor.**
6. **Site Camera Poles and Bases** are to be provided by **Electrical Contractor**.
7. **Fire Alarm and Security Contractor** to exclude all work specifically provided by **Electrical Contractor.**
8. **Electrical Contractor** to exclude all work specifically provided by **Fire Alarm and Security Contractor.**

N. Identification of Electrical:
   1. Provide updated Panel Schedules and Labeling in Electrical Panels for all circuit breakers installed or changed under this contract.
   2. Provide Labelling all electrical junction boxes with Panel Labels and Circuit Breaker Number that feeds each Junction Box.
   3. Provide Labelling of all outlets, devices, and equipment indicating Panel Labels and Circuit Breaker Numbers.
   4. Provide Labelling of all Data/Telecommunication Lines installed under this Contract at each end of the line.

O. Commissioning: Provide Contractor Commissioning Responsibilities as indicated in 260995 – Commissioning of Electrical Systems.

P. Electrical Site Work:
   1. **General Contractor** or **Site Contractor** shall provide "Utility Trench Excavation" to the **Electrical Contractor** for:
      a. **Utility Trench Excavation**: For all underground utilities: **General Contractor or Site Contractor** is to provide Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
      b. Provide **Utility Trench Excavation** for the following utilities:
         1) All underground Electrical/Telecom/Data/Fiber utilities and conduits shown on Electric or Civil Drawings.
         2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
         3) Floor boxes and associated conduits indicated on Electrical Drawings.
   2. The following items shall be furnished by **Electrical Contractor (Contract #3)** and turned over to be set by **Site Contractor** as indicated on Electrical or Civil Drawings: Light Pole Bases, Camera Pole Bases, Electric Manholes, Electrical Hand Holes, Transformer Vaults, and Electric Vehicle Charging Station bases.

Q. Provide owner training of systems installed. In addition to Training required by other spec sections, provide at minimum the following training upon equipment/system completion and acceptance (per 018200 Demonstration Training Specification):
   1. Generator System.
   2. Unitary Power System (UPS)
   3. Photovoltaic System.
   4. Battery Energy Storage System (BESS).
   5. Panelboards.
   6. Exterior Lighting Control.
   7. Interior Lighting System and Control.
   8. Lightning Protection System
   9. Roof Deicing System.

1.8 CONTRACT 4 - PLUMBING CONSTRUCTION WORK: (Also referred to as: "Plumbing Contractor" or "PC")

A. The Work of the Plumbing Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Plumbing Construction work.

   a. Drawings:
      1) All "G" or "T" (General) and "A050" (Life Safety Drawings)
      2) All "P" Electrical Series Drawings – Provide all work.
      3) For Coordination purposes:
         a) Review All "A" (Architectural), "S" Structural, "C" (Civil), "M" (Mechanical), "E" (Electrical), "FF" (Furniture), "FP" (Fire Protection), TN (Telecommunications), "TY" (Security), "TA" (Audio Visual) series drawings as it relates to the work of this contract.

   b. Specifications:
      1) Division 0 – Procurement and Contracting Requirement, all Sections.
      2) Division 1 – General Requirements all Sections.
      3) Division 2 – Section 024119, Selective Demolition.
      4) Division 7 – Sections 078413 & 078443, Penetration & joint Firestopping as required for the Work of this Contract.
      5) Division 8 – Access Doors as needed.
      6) Division 22 – Plumbing, all sections.

B. Coordination:
   1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
      a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
      b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
      c. Final Cleaning Schedule.
      d. MEP work.
      e. Blocking for Wall Mounted Equipment.
      f. Casework with other wall mounted items.
      g. Underground Utilities and Trench Locations.
      h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
      i. Electrical Requirements and connections for Equipment.
      j. Access Door locations.
      k. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
      l. Temporary Enclosures and Building Access.
      m. Temporary Facilities for use by other Contractors.

2. Site Utility Coordination:
    a. Provide Storm drain/Sump Drain water piping to 5' outside building foundation perimeter. Coordinate with Contract #5 Site Contractor.
    b. Provide all sanitary piping and sanitary system indicated in 221313 Facility Sanitary Sewers to 5' outside building line. Site Contractor to provide piping/sanitary work from outside 5' building line. Coordinate with Site Contract #5.

C. Temporary Facilities
1. Provide Temporary Facility responsibilities indicated in "011200 - Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
    a. Additional Requirements indicated in "011500 - Temporary Facilities and Controls."

D. Common Plumbing Requirements:
1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
2. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor (Contract #1) as required for maintenance, service, or code.
3. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
    a. Includes Equipment Finishes, cover plates, exposed conduits/wire mold, and any other pre-painted finished items or devices prior to ordering of material.
5. See Architectural Elevations for additional information for locations of wall mounted fixtures and plumbing devices.
6. Provide single piece properly sized Piping Escutcheons on all exposed piping penetrations at plumbing fixtures that properly cover any exposed unfinished surfaces.
7. Provide all testing, balancing, and disinfection of all new and modified Plumbing Systems.
    a. Submit Documentation of procedures and results for approval.

E. Project Specific Requirements:
1. Concrete Equipment Pads:
    a. **General Contractor** shall provide Concrete Pads for Plumbing Equipment in Water Room 157 as indicated on A-111. Plumbing Contractor to provide Layout. All other Plumbing Pads by Plumbing Contractor.
2. Provide all plumbing equipment indicated in Water Room 157 shown on P202 Detail 1 and P301/P302.
3. Power wiring and Control wiring for Hot Water Time Clock for Recirculation pump on P302 by EC. Programing and commissioning of Time Clock by Plumbing Contractor.

F. Identification and Labeling: Provide Labeling of all piping, equipment, and valves.
1. Equipment, Piping, and Control Valve Labelling shall be sized to be visible from ground level.
2. Provide complete schedules of the following items:
    a. Equipment Label Schedule with Equipment Model and Serial Numbers.
    b. Maintenance and Test Interval Schedule of all equipment.
    c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
        1) (Filters, Belts, Seals, Fluids, etc.)
    d. Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function)

3. Provide additional labels for valves, dampers, or equipment above Ceilings or behind an Access Door, and install Labels on Ceiling or Access Door.

G. Electrical Wiring of Equipment and Devices:
   1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.

H. Fire Protection System: Provide Fire Protection system as indicated on FP-101. Wiring of Clean Agent Fire Suppression System Control Panel by the Plumbing Contractor.
   1. Provide per 212200 Clean Agent Fire Suppression and 210500 Common Work Results for Fire Suppression.
   2. Coordinate with Fire Alarm Contractor for Connection of Fire Suppression System to Fire Alarm System.
   3. 120 VAC Power Supply provided by EC to Fire Protection Control Panel.
   4. Internal Control Wiring for Fire Protection System, Programing, and commissioning of Clean Agent Fire Suppression Control Panel by Plumbing Contractor.

I. Commissioning:
   1. Provide Contractor Commissioning Responsibilities as indicated in 220800 - Plumbing Commissioning.

J. Provide owner training of systems installed. In addition to Training required by other spec sections, provide at minimum the following training upon equipment/system completion and acceptance (per 018200 Demonstration Training Specification):
   1. Water Heaters
   2. Recirculating Pumps
   3. Plumbing Fixtures
   4. Hot Water Return Balancing Stations
   5. Domestic Water System Pressure Booster Pumps
   6. Fire Protection System

1.9 CONTRACT 5 - SITE CONSTRUCTION WORK: (Also referred to as: "Site Contractor" or "SC")

A. The Work of the Site Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
   1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Site Construction Work.
      a. Drawings:
         1) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
         2) All "C" Civil Series Drawings – Provide all work.
         3) For Coordination purposes:
            a) Review All "A" (Architectural), "S" Structural, "M" (Mechanical), "E" (Electrical), "P" (Plumbing), "FF" (Furniture), "FP" (Fire Protection), TN (Telecommunications), "TY" (Security), "TA" (Audio Visual) series drawings as it relates to the work of this contract.
      b. Specifications:
         1) Division 0 – Procurement and Contracting Requirement, all Sections.
         2) Division 1 – General Requirements, all Sections,
         3) Division 2 – Existing Conditions, all sections.
         4) Division 3 – Concrete – as needed per Site/Building Delineation.
         5) Division 5 – Metals – as required per Site/Building Delineation.
         6) Division 7 – Joint Sealants – as needed per Site/Building Delineation.
         7) Division 10 – Only Include sections below:
            a) 101453 - Traffic Signage
            b) 107500 – Flag Poles
         8) Division 23 – 232000 – HVAC Piping (for Geothermal Well Piping)
            a) Include "232113 - Ground Loop Heat Pump Piping" Specification for Geothermal Work Requirements.
         9) Division 26 – Include sections below:
            a) 260024 Electrical Trenching, Backfill, and Compaction
         10) Division 31 – Earthwork, all sections.
         11) Division 32 – Site Improvements, all sections.
         12) Division 33 – Utilities, all sections.
         13) Division 34 - Transportation, all sections. Exclude 346013 – Electric Vehicle Charging Stations.

B. Unit Prices: Include in Base Bid Quantities as indicated in 012201 Unit Prices for:
   1. UP1 – Removal and Disposal offsite of contaminated Soils and replacement with satisfactory soil material. See Appendix C Remedial Action Workplan.
   2. UP2 – Installation Geothermal Steel Well Casings.

C. Coordination:
   1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
      a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
      b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
      c. Final Cleaning Schedule.

d. MEP work.
e. Underground Utilities and Trench Locations.
f. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
g. Electrical Requirements and connections for Equipment.
h. Access Door locations.
i. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
j. Temporary Enclosures and Building Access.
k. Temporary Facilities for use by other Contractors.

D. Temporary Facilities
1. Provide Temporary Facility responsibilities indicated in "011200 - Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
a. Additional Requirements indicated in "011500 - Temporary Facilities and Controls."

E. Common Site Work Requirements:
1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
2. Provide concrete and asphalt paving, landscaping, site appurtenances, flag poles, concrete bollards, and curbing. The Site Contractor shall perform all necessary excavation, backfilling, compaction, and required concrete.
3. Contractor shall obtain and pay for any permits, inspections, or certifications from governing authorities having jurisdiction over the work to be performed, or over the finished product to be installed by this Contractor.
4. Review Geotechnical Report for existing soil conditions of site.

F. Project Specific Requirements:
1. Adhere to all requirements indicated in Appendix C: Remedial Action Work Plan
a. The Contractor's Project Supervisor must have successfully completed a 40 Hour Health and Safety Training Course for Hazardous Waste Operations, and an annual 8-hour Refresher Course.
b. Adhere to all other Safety Requirements indicated in Remedial Action Workplan.
2. Follow procedures in Appendix C: Remedial Action Workplan for management of contaminated soils. See 012201 - Unit Prices for Scope of this portion of work.
3. Provide Concrete Encasement of Electrical Conduits for specific conduits noted on E-002 and E-003 in general notes and notes on plan. See E603 for Concrete Encasement Details.
4. Set Concrete Transformer Vaults for Transformers.
5. Provide Concrete Bases for Emergency Call Stations shown on Electrical Site Drawings.
6. Remedial Action Workplan:
a. The Plesser property is a brownfield cleanup program (BCP) site (Site no. C356053) under the New York State Department of Environmental Conservation (NYSDEC).
b. The site is subject to a remedial action work plan (RAWP) to be implemented during site development activities to remediate soils contaminated with arsenic, dieldrin, lead and mercury in portions of the site.
c. A draft RAWP (Appendix C) is currently under review by NYSDEC. A NYSDEC-approved RAWP will be provided to the site contractor upon approval.
d. All work to be performed on-site shall be performed in accordance with approved RAWP.
e. Construction observation during remediation/site development activities to be conducted by a remediation engineer representative.

f. THE RAWP is to be used as a governing document for Contractor Procedures and Information for the areas. Contractor to follow all procedures within this document for management of soils.
   1) Dust Control and Management procedures to be performed by Site Contractor as described in "RAWP".
   2) The Site Contractor shall cooperate with Testing and Monitoring Agency and allow sufficient time for testing and sampling procedures as described in the "RAWP".
   3) Provide management of contaminated Ground Water within Project Limits as described in "RAWP".
   4) Provide Surveying Services as described in "RAWP" and additional surveying requirements described in "Quality Assurance Project Plan" of the "RAWP."

g. The Site Contractor shall attend a Preconstruction Meeting to review procedures with the Architect and Design Team, inclusive of Remediation Engineer.

h. The Site Contractor shall provide a site supervisor who maintains an OSHA 40 HAZWOPER Certification.

i. The select areas of remediation under this Contract shall be defined in this section:

j. **Dieldrin Removal:**
   1) See Unit Price SC-UP1 within "012200 - Unit Prices" for work required for this scope including offsite disposal.
   2) See "Remedial Action Work Plan – Appendix C" for procedures and other requirements to support this work.

k. **Management of Contaminated Soils within Project Limits:**
   1) See "Alternative No.3 Limited Excavation, Surface Cover, Institutional and Engineering Controls and Monitored Natural Attenuation of Groundwater Impacts" within a. "Remedial Action Work Plan – Appendix C" for the selected method of managing contaminated soils.
      a) Contaminated Soils to be reused onsite per RAWP procedures. Reuse of contaminated soils under a surface cover system to be approved by NYSDEC. No Soil to be disposed of offsite. Offsite disposal at an approved facility, if warranted, requires waste characterization and shall be performed in accordance with the RAWP.
   2) See "Figure 6: Extent of Contamination in Soils Map and Drum Carcass Area" within "Remedial Action Work Plan – Appendix C" for all locations of contaminated soils and depths to be managed by Alternative No. 3.
      a) The Site Contractor shall only remediate a portion of the contaminated soils on Figure 6 as defined in this section and not all contaminated soils outside the limits of disturbance or outside utility trench areas.
   3) See Civil Drawing's "Limits of Disturbance" for areas to be remediated within the Contaminated Soils Map under the Site Contract.
   4) See Electrical Drawings for Utility Trench Areas to be remediated within the Contaminated Soils Map under the Site Contract. Provide remediation for soils at the southern electrical conduit Duct Bank.
   5) The Contractor Staging Area shown on the "Staging Area and Logistics Plan" shall not extend the "Limits of Disturbance" for remediation requirements under Alternative No. 3. Contractor shall submit a Shop Drawing for the Staging Area Construction and materials used prior to installation. Proper Fabric and fill material shall be used to separate the Staging Area from any contaminated soils beneath.
   6) Remediated Soils to be placed in a berm to the south of the Detention Pond Area. No remediated soils under this section are to leave the site.

G. Identification and Labeling: Provide Labeling of all equipment.
   1. Equipment Labelling shall be sized to be visible from ground level.
   2. Provide complete schedules of the following items:
      a. Equipment Label Schedule with Equipment Model and Serial Numbers.
      b. Maintenance and Test Interval Schedule of all equipment.
      c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
         1) (Filters, Belts, Seals, Fluids, etc.)
      d. Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function)

H. Electrical Wiring of Equipment and Devices:
   1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.

I. The **Site Contractor (Contract #5)** is responsible for installation of and maintenance of all Temporary Erosion / wastewater and Sediment Control measure for the duration of the project as specified in Plans and Specifications, "Erosion / waste-water Control."
   1. Address erosion control deficiency items within 7 days of notification.
   2. Provide written documentation of all Erosion Control Activities including corrective actions.

J. Electrical Site Work:
   1. **Site Contractor** shall provide "Utility Trench Excavation" to the **Electrical Contractor** for:
      a. Utility Trench Excavation: For all underground utilities shown on any Contract Drawings, the **General Contractor** or **Site Contractor** (per their respective designated "Scope Delineation Areas") are to provide: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
      b. Provide **Utility Trench Excavation** for the following utilities:
         1) All underground Electrical/Telecom/Data/Fiber utilities and conduits shown on Electric or Civil Drawings.
         2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
         3) Floor boxes and associated conduits indicated on Electrical Drawings.
   2. The following items shall be furnished by **Electrical Contractor** and turned over to be set by **Site Contractor** as indicated on Electrical or Civil Drawings: Light Pole Bases, Camera Pole Bases, Electric Manholes, Electrical Hand Holes, Transformer Vaults, and Electric Vehicle Charging Station bases.

K. Commissioning:
   1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.

L. Provide owner training of systems installed. In addition to Training required by other spec sections, provide at minimum the following training upon equipment/system completion and acceptance (per 018200 Demonstration Training Specification):
   1. Septic System and Dosing Tank Controls.
   2. Water Utility System
   3. Storm Drainage System
   4. Geothermal Well System

5. Turfs and Grasses
6. Plantings
7. Active Vehicle Barrier System

M. **Site/Civil work Scope Delineation between General Contract (Contract #1) and Site Contractor (Contract #5): Civil/Site Work provided by Site Contractor (Contract #5) indicated below:**

1. Site/Civil work "Scope Delineation Areas": The **New Building** and **Generator/Energy Storage Enclosure locations** + 5-foot zone from perimeter of foundations of locations are designated as responsible by: **General Contractor (Contract #1)**. All other Site/Civil work outside these areas is designated by **Site Contractor (Contract #5).**
2. Survey and Layout (per respective designated "Scope Delineation Areas"):
   a. Provide services of a licensed surveyor to provide layout required for all new work.
   b. For areas within new building footprints, provide field markings of: new building layout, column line layout, finished floor elevations, and as-built point of reference locations.
   c. Provide existing utility mark out of any existing utilities on site.
   d. Provide maintenance of surveyor layout and existing utility markings throughout the duration of the project and restore markings if disturbed during construction.
   e. Provide surveyed as-built locations and elevations of all underground utilities installed under this contract or excavated by this contract when utility install is by others, all to be recorded and supplied on CAD and PDF As-Built Drawings.
3. Earthwork: The **General Contractor** or **Site Contractor** (per their respective designated "Scope Delineation Areas") are to provide all site earthwork, excavation, bedding, backfill, subbase, and base material, including dewatering as required for the installation of work of this Contract:
   a. General Excavation: Excavations shall be in conformance with current OSHA regulations. Structure Excavation shall be made to the elevations, slopes and limits shown on the plans. Bottom of excavations shall be level and in firm, solid material; where soft or otherwise unsuitable material is encountered, such material shall be removed and replaced with properly compacted earth material, stone or flowable fill, as directed by the Architect or Construction Manager. Excavated material suitable for fill or backfill shall be stockpiled on the site to be turned over to **Site Contractor** for future use. Excess Material shall be properly disposed of by **Site Contractor.**
   b. Backfill: Provide specified backfill including when indicated Structural Fill under Building areas as indicated by Drawings and Specifications.
   c. Dewatering: An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the Architect or Construction Manager. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress.
      1) Dewatering shall remain in place until directed to be removed by the Construction Manager.
      2) Excavated areas shall be kept free of water during construction. Where necessary, excavations shall be protected by shoring, sheeting, cofferdams, or other suitable methods.
      3) The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation.
      4) Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage and does not cause damage to any portion of the work or adjacent property.
      5) All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage.

6) The dewatering system shall be maintained until backfilling is complete.
7) All damages resulting from the dewatering shall be repaired by the Contractor to the satisfaction of the Architect and at no cost to the Owner.

4. Utility Trench Excavation: For all underground utilities shown on any Contract Drawings, the **General Contractor** or **Site Contractor** (per their respective designated "Scope Delineation Areas") are to provide: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
   a. Provide for the following utilities:
      1) All underground Electrical/Telecom/Data/Fiber utilities and conduits shown on Electric/Civil/Telecommunications/Security Drawings.
      2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
      3) Floor boxes and associated conduits indicated on Electrical Drawings.
      4) Domestic Water Supply indicated on Plumbing/Civil Drawings.
      5) Sanitary/Sewer indicated on Plumbing/Civil Drawings.
      6) Sprinkler Piping indicated on Fire Protection/Civil Drawings
      7) Storm/Sump/Footing Drain indicated on Plumbing/Civil Drawings.
      8) Geothermal Piping indicated on Mechanical/Civil Drawings.
      9) Underground Refrigerant piping indicated on Mechanical Drawings.
   b. **General Contractor** is to provide any foundation footing drains indicated on Architectural Drawings at the foundation, and Site Contractor to provide footing drain piping from 5 feet outside building perimeter.
5. Site Demolition: The **Site Contractor** is to provide **all** demolition as indicated on Civil Drawings, including within areas designated as responsibility by **General Contractor within "Scope Delineation Areas"**. Including Removing Existing Vegetation, Clearing and Grubbing, Stripping and Stockpiling Topsoil (Topsoil to be turned over to the **Site Contractor)**, removal of existing above/below grade site features and improvements and backfill after removal, removal of existing utilities and backfill after removal, and all other demolition indicated on Civil Demolition Drawings.
6. Site Landscaping: Landscaping, Topsoil, Turfs and Grasses, Plantings, Restoration, shall be provided by the **Site Contractor** as indicated on Civil Drawings including within areas designated as responsibility by **General Contractor within "Scope Delineation Areas"**.
7. Site Concrete:
   a. The **General Contractor** will provide all foundation walls, retaining walls, and staircases (including landings at each end of the staircase) as specifically indicated in Structural Drawings, even if depicted on exterior of building. Sidewalks or Slabs within these retaining walls, foundation walls, or staircase landings shall be provided by the **General Contractor**.
   b. The **General Contractor** shall provide the first exterior concrete landing or sidewalk panels outside of all exterior doors to the first exterior expansion or control joint.
      1) Expansion Joints between interior and exterior slabs at doorways shall transition under each building exterior door transition or threshold.
   c. **Site Contractor** to provide all concrete stairs, sidewalks, slabs, pads, retaining walls, and other concrete features/concrete work indicated on Civil Drawings that are not specifically indicated to be provided by General Contractor or Others.
   d. Provide shop drawings for all concrete work including field measurements and elevations of any existing connection locations prior to installation. General Contractor and Site Contractor shall coordinate concrete transitions prior to performing any concrete work.

e. Each Contractor is to provide their own concrete wash out areas and restoration as required for their own work.

N. Geothermal work:

a. All Geothermal work outside building foundation and branch piping penetrating through foundation (with caps and sufficient piping length for connection by Mechanical Contractor) to be provided by **Site Contractor.**

b. **Site Contractor** to provide all pressure testing, flushing, and all other quality control requirements for piping installed by Site Contractor after Mechanical contractor has connected piping manifold.

c. **Mechanical Contractor** to provide Pipe Manifold, connections to branch piping, provide piping specialties, valves, balance valves, additional valves for testing purposes of the geothermal system, foundation sleeves (see structural drawings), insulation, Fernco fittings, and all other piping accessories/connections shown on manifold detail section on M-401 and as needed for a complete balanced well system.

1) **Mechanical Contractor** to provide final filling of fluid for the entire geothermal well system.

d. **Site Contractor** to include handling and management of drill slurry/fluid to treated and managed to be reused onsite for proper compaction within landscape areas.

e. See section in Summary of Work for "Geothermal Installation Sequence and Coordination".

f. Provide written documentation of coordination of entire installation process, shop drawings, and products between Mechanical Contractor, General Contractor (for foundation penetration locations) and Site Contractor to be submitted to Construction Manager/Architect prior to start of all work.

O. Geothermal Installation Sequence and Coordination:

1. Specific scope associated with Work at Geothermal Wells – This method appears to be the industry standard for Geothermal Well installation. If upon coordination of the entire Project Team, including the Architect, Construction Manager, Owner and all Prime Contractors, a more efficient and more practiced construction method exists, and does not incur any additional costs to any member of the Project Team; it may be submitted to the Construction Manager for review and approval prior to start of activity.

a. Sequence:

1) Site Contractor establishes benchmark and offset elevations including locating all wells.

2) Site Construction Work Contractor installs all necessary site work management controls including all necessary erosion / wastewater controls.

3) Site Contractor performs all removals and topsoil stockpiling.

4) Site Contractor shall also remove top layer of contaminated Soils as indicated in Remedial Action Work Plan Appendix C of Specifications.

5) Site Contractor excavates trench from all well areas to the manifold structure within the building through foundation.

6) Geothermal Wells Contractor (under Site Contractor) drills geothermal wells.

7) Site Contractor removes Well Drilling Fluid/Slurry per in Remedial Action Work Plan Appendix C of Specifications.

8) Site Contractor installs all precast concrete structures and underground utilities, including light poles, storm water basins, and underground piping and conduits.

9) Geothermal Wells Contractor (under Site Contractor) installs all piping loops, well casing and well grouting after all other nearby utilities are installed to avoid damage.

10) Geothermal Wells Contractor (under Site Contractor) installs piping from wells to manifold structure location within the building footprint capped and prepared for connection by Mechanical Contractor.
    a) Geothermal Wells Contractor (under Site Contractor) to allow time for building construction to proceed for Construction of Mechanical Room and Piping Manifolds prior to return to site.
11) Mechanical Contractor to install Piping Manifolds and Accessories.
12) Geothermal Wells Contractor (under Site Contractor) performs pressure test and flushing procedures on all piping and caps lines as necessary.
13) Site Construction Work Contractor backfills all well piping in bedding material as specified.
14) Site Contractor backfills all areas necessary to install remainder of Site Contractors Work according to specifications. Well pipes to remain pressurized until backfilling is complete. If pipes are damaged during backfilling operations, they are to be repaired immediately and re-pressurized.
15) Geothermal Wells Contractor (under Site Contractor) Flushes Geothermal System.
16) Mechanical Contractor to provide geothermal energy recovery piping from Manifold.
17) Site Contractor to backfills and compact trench with detectable warning tape from building to all wells.

1.10 CONTRACT 6 - FIRE ALARM AND SECURITY CONSTRUCTION WORK (Also referred to as: "Fire Alarm and Security Contractor" or "FSC")

A. The Work of the Fire Alarm and Security Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Site Construction Work.

    a. Drawings:
        1) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
        2) All work shown on "E-301" – "Systems Plan", "E-501" – "Electrical Schedules", E-604" – Electrical Details. (For Fire Alarm and Security System work) drawings except as excluded and to be provided by **Electrical Contractor.**
        3) All "TY" (Security) series drawings except for work specifically indicated to be provided by **Electrical Contractor**, which is to be excluded from the **Fire Alarm and Security Contract**.
        4) For Coordination purposes:
            a) Review Architectural "A" Elevation Drawings for coordination purposes.
            b) Review "TN" (Telecommunications) Series Drawings for Data Infrastructure to support Security System.
            c) Review All "A" (Architectural), "LS or A" (Life Safety Drawings), "S" Structural, "M" (Mechanical), "E" (Electrical), "P" (Plumbing), "FF" (Furniture), "FP" (Fire Protection), "TY" (Security) series drawings as it relates to the work of this contract.
    b. Specifications:
        1) Division 0 – Procurement and Contracting Requirement, all Sections.
        2) Division 1 – General Requirements, all Sections
            a) Include all Contractual Requirements indicated in AIA 132 Contract and AIA 232 General Conditions.
            b) Payment, Performance, and Bid Bonds to be excluded from Fire Alarm and Security Contract.
        3) Division 28 – All Sections except for work specifically indicated to be provided by **Electrical Contractor**, which is to be excluded from the **Fire Alarm and Security Contract**.

B. **General Requirements for Fire Alarm and Security Contractor (FSC)**:

1. Provide Owner Training of Fire Alarm system with a minimum of (1) 4-Hour Training Sessions.
    a. Provide (1) additional Training Session if Fire Alarm system has not reached final completion acceptance by date required per Contract Milestone Schedule for temporary use of the system prior to final completion.
2. Provide Owner Training for Security System as indicated in 280500 – Common Work results for Elect. Safety and Security.
3. Warranties and Maintenance Schedules to start the date of Substantial Completion and extended for incomplete equipment or systems identified during Substantial Completion Inspection.
4. **Fire Alarm and Security Contractor** to provide Start Up, Functional Testing, and Commissioning reports of all equipment and software: to be submitted as written reports.

a. Include **Electrical Contractor's** Approved Test Reports for Data Cables with final commissioning report.

5. **Fire Alarm and Security Contractor** to provide coordination, wiring, and equipment needed to facilitate the integration of Camera Security System to Audio Visual System.

C. **Fire Alarm and Security Scope of work between Electrical Contractor Fire Alarm and Security Contractor:**

1. Electrical Contractor to provide: Shop Drawings, Coordination Drawings, and Product Submittals to **Fire Alarm and Security Contractor** for all work relating to the Fire Alarm Scope that includes model numbers and layout locations on elevations and floor plans.
   a. **Electrical Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors for Fire Alarm and Security work.
   b. See 283100 - Addressable Fire Alarm for information on conduit requirements.
2. Fire Alarm and Security Wiring:
   a. **Fire Alarm and Security Contractor** to provide all wiring required for devices of the Fire Alarm System. Wiring to be installed prior to Ceiling Installation.
   b. Fire Alarm Wiring to HVAC Equipment to be provided by Fire Alarm Contractor.
   c. For the Security System: **Electrical Contractor** shall provide terminated, tested, and labelled: CAT6A & 18/4 Cable with sufficient length to all doors indicated with Electric Strike or Card Reader per TY-201 – Security Floor Plan, and TY-701 - Security Details.
   d. **At Automatic Operator/Opener Locations Only: Electrical Contractor** to provide control wiring and conduits for ADA Automatic Operators/Openers and any associated Electrified Hardware, Push Buttons, Electrified Panic Bars or Electrified Strikes. Connection to Security System for Card Reader Access to be connected by **Fire Alarm and Security Contractor** after ADA operator is commissioned.
   e. Any additional local wiring for doors/electric strikes/locksets/card readers, request to exit motion sensors to be provided and installed by **Fire Alarm and Security Contractor (FSC)** to provide a complete and functioning system per design.
   f. **Electrical Contractor** to provide Site Fiber Indicated on **TN-100.**
   g. All local wiring and connection to Equipment or racks in IT Room to be provided by **Fire Alarm and Security Contractor**.
   h. **Fire Alarm and Security Contractor** to provide all wiring for Emergency Call Stations including site wiring in site conduits. Utilize **Electrical Contractor** provided underground conduits indicated on Electrical Drawings.
   i. **Fire Alarm and Security Contractor** to provide all other wiring required for a complete system for wiring that is not specifically indicated as to be provided by **Electrical Contractor.**
3. Conduits and Support for Wiring:
   a. **Electrical Contractor** to provide for all **wall mounted** Fire Alarm and Security devices:
      1) Proper Device Back-box, Conduit ran to above ceiling height, stubbed for future wiring by Fire Alarm and Security Contractor.
      2) Coordinate with **General Contractor** for wall mounted devices to be installed recessed in Concrete, Masonry, or ICF Walls.
      3) **Electrical Contractor** to provide firestopping/sealing around the exterior of all conduits and sleeves installed.
      4) **Fire Alarm and Security Contractor** to provide firestopping/sealing of interior of conduit/sleeve after wiring has been installed**.**
      5) **Fire Alarm and Security Contractor** to provide Acoustic Sealant of all Fire Alarm and Security device back boxes.

b. **Electrical Contractor** to provide fire-stopped/sealed sleeves in sufficient size and quantity to all partitions or walls to allow fire alarm wiring to terminate to all devices in all rooms within the building.

c. **Electrical contractor** shall provide all conduits shown on TY-701 Security Details for all devices including but not limited to: Card Readers, Door Contacts, Request to Exit Motion Sensors, Power Transfer Hinges, and Junction Boxes. Install Pull String through all conduits.

1) **Electrical Contractor** to review Door and Hardware Schedule indicate on A-911 Door Schedule and Specification Section 080671 Door Hardware Schedule to coordinate their own work.

d. Open Cable shall be allowed above ceilings and in "attics". "Open to Structure" Ceilings shall require conduits and back boxes by electrical Contractor.

1) See A801 Reflected Ceiling Plan for Ceiling Type information.
2) See 283100 - Addressable Fire Alarm for information on conduit requirements.

e. Devices mounted in Ceilings are to be wired and installed with proper back boxes and device support by:

1) **Fire Alarm and Security Contractor** proper Ceiling device back box after ceiling framing or grid is installed.
2) **Fire Alarm and Security Contractor** to install Ceiling Devices after ceiling tile install, cut drop ceiling tiles as needed for devices if required.

f. Site Conduits for Site Cameras shall be provided by Electrical Contractor.

4. Devices:

a. The **General Contractor** shall provide and install/mount all electrified Hardware indicated within "080671" – "Door Hardware Schedule". Excludes Card/Fob Readers which are to be provided by Fire Alarm and Security Contractor.

b. **Fire Alarm and Security Contractor** to provide and install all Fire Alarm and Security Devices indicated on Contract Drawings and connect to any wiring provided by Electrical Contractor.

1) Fire Alarm devices include: All devices shown on E-301, and any other devices, relays, and accessories required for a fully functioning system to meet design requirements.
2) Security Devices Include: All devices shown on TY Drawings with exclusion to electrified hardware indicated in "080671" – "Door Hardware Schedule" which is to be **excluded from the Fire Alarm and Security Contractor** and provided by **General Contractor**. Provide any other devices, equipment and accessories required for a fully functioning system to meet design requirements.

a) **The Fire Alarm and Security Contractor** is to provide "**ACM**" Access Control Modules at Door Locations.
b) **Site Emergency Call Stations** to be provided in their entirety by Fire Alarm and Security Contractor. See Electrical Drawings.

5. **Electrical Contractor** to provide power to Fire Alarm Control Panel and sufficient conduits from Fire Alarm Control Panel to above ceiling to support all fire alarm wiring. All other work and materials for the Installation of the Fire Alarm Control Panel Shall be by **Fire Alarm and Security Contractor.**
6. **Site Camera Poles and Bases** are to be provided by **Electrical Contractor**.
7. **Fire Alarm and Security Contractor** to exclude all work specifically provided by **Electrical Contractor.**
8. **Electrical Contractor** to exclude all work specifically provided by **Fire Alarm and Security Contractor.**

1.11 CONTRACT 7 – AUDIO-VISUAL CONSTRUCTION WORK: (Also referred to as: "Audio-Visual Contractor" or "AVC")

A. The Work of the Audio-Visual Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Site Construction Work.

a. Drawings:
   1) All work shown on "TA" (Audio-Visual) except for work specifically indicated to be provided by **Electrical Contractor**, which is to be excluded from the **Audio-Visual Contract.**
   2) For Coordination purposes:
      a) Review Architectural "A" Elevation Drawings for coordination purposes.
      b) Review TN (Telecommunications) Series Drawings for Data Infrastructure to support Audio Visual System.
      c) Review All "A" (Architectural), "A-050" (Life Safety Drawings), "S" Structural, "M" (Mechanical), "E" (Electrical), "P" (Plumbing), "FF" (Furniture), "FP" (Fire Protection), "TN" (Telecommunications), "TY" (Security) series drawings as it relates to the work of this contract.
   3) All "G" or "T" (General) and "LS or A" (Life Safety Drawings)

b. Specifications:
   1) Division 0 – Procurement and Contracting Requirement, all Sections.
   2) Division 1 – General Requirements, all Sections
      a) Include all Contractual Requirements indicated in AIA 132 Contract and AIA 232 General Conditions.
      b) Payment, Performance, and Bid Bonds to be excluded from Audio Visual Contract.
   3) Specification Section: 115223 AV Supports.
   4) Division 27 – To be followed as required to support the work of Audio-Visual Contract except for work specifically indicated to be provided by **Electrical Contractor**, which is to be excluded from the **Audio-Visual Contract.**
   5) Provide all items indicated within **274116 – Audio Visual Systems** Specification except for work specifically indicated to be provided by **Electrical Contractor,** which is to be excluded from the Audio-Visual Contract.

B. **General Requirements for Audio Visual Contractor (AVC)**:

a. Provide Owner Training of Audiovisual system with a minimum of (2) 4-Hour Training Sessions to be completed within a year after final completion and acceptance of System.
   1) Provide (1) additional Training Session if system has not reached final completion acceptance by date required per Contract Milestone Schedule for temporary use of the system prior to final completion.

b. Warranties and Maintenance Schedules to start the date of Substantial Completion and extended for incomplete equipment or systems identified during Substantial Completion Inspection.

c. Provide additional programming adjustments after a 6-month period from the date of final completion for changes as requested by Owner.

C. **Electrical Contractor** to provide as indicated on TA/TN Drawings:
   1. Shop Drawings, Coordination Drawings, and Product Submittals to Audiovisual Contractor for all work relating to the Audio-visual Scope that includes model numbers and layout locations on elevations and floor plans.
      a. Utilize Architectural Elevations for layout, coordinate with general notes on TA Drawings regarding placement of Displays and Speakers to be centered with respect to furniture or tables. Provide Submittal.
      b. **Electrical Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors.
   2. Data Wiring for terminated, tested, and labelled on both ends: data lines from AV Room 151 to all locations requiring AV Data Lines as indicated on **TN or TA Drawings**.
   3. Power outlets for all displays as indicated on TA Drawings.
   4. AV Racks in AV Room 151 as specified in 271116 – Cabinets and Racks.
   5. Speaker Wires shown on TA-803- "Other Rack Devices" Detail: Cables from AV Racks in AV Room 151 to locations indicated on TA/TN Drawings:
      a. **Electrical Contractor** to furnish and install Ceiling Speakers indicated on TA Drawings Tagged as Items: "5-1".
      b. **Electrical Contractor** to figure product: "Manufacturer: QSC, Model: AD-C6T-LP" for speakers. Confirm product via submittal process during construction.
   6. At Audio video Touch Panel locations, **Electrical Contractor** to provide data lines as indicated on TA-801, TA-802, TA-803
      a. For Tabletop Touch Panels, Electrical Contractor to provide data lines from AV Rack in Room 151 to Touch Panel location via floor box with sufficient length to reach Table Touch Panel as coordinated by Audio Visual and Furniture Contractor.
      b. For Wall Mounted Touch Panels, Electrical Contractor to provide data lines from AV Rack in Room 151 to touch panel location via conduit, back box, and fire stopped conduit stub above ceiling. Coordinate Surface mount vs recessed back box type via submittal process and coordination with **Audio-Visual Contractor (AVC).**
   7. **Electrical Contractor** to furnish and install In Wall Back Boxes for all displays indicated on TA Drawings. Coordinate with General Contractor for blocking Locations.
      a. Item Tags indicated on TA Drawings as P501, P526, P527 are to reference In Wall Back Boxes for Flat Panel Displays.
      b. Provide all junction boxes, fire stopped conduits, and back boxes indicated on TA Drawings.
   8. Floor box Types serving AV Equipment to follow details on Electrical "E" Drawings for Floor Box types.
   9. **Electrical Contractor** to provide Power Bus Duct as indicated on Detail 7 – E604 and as noted on TN-601 Detail 2 for power to AV rack devices. All other power cords from Bus Duct on E604 Detail 7 to devices to be provided by Audio Visual Contractor.
   10. Exclude all work specifically indicated to be provided by **Audio Visual Contractor (AVC)** Scope.

D. **Audio-Visual Contractor (AVC)** to provide:
   1. Furnishment and Installation of Displays, Display Mounts, Video Walls, Video Bars, Sound Bars, Encoders, Decoders, Video DA's, Touch Panels, AV Rack Devices, local Power Supplies, local wiring at: (displays, encoders, monitors, video bars, soundbars, and video walls), and all local wiring and patch cabling within AV Room 151.
   2. Office Monitors to be provided by Owner.
      a. Connection and wiring of Owner provided Monitors to Audio Visual System by **Audio-Visual Contractor.**
   3. Exclude all work specifically indicated to be provided by **Electrical Contractor.**
   4. Provide any other devices, equipment shown on TA Drawings or required per 274116 – Audio-Visual Systems Specification Section (except as excluded by Electrical Contractor)

or any other devices and equipment required to provide a complete and functioning system shall be provided by **Audio-Visual Contractor (AVC).**

5. Provide all other wiring required for the Audio-Visual System that is not already specifically indicated to be provided by **Electrical Contractor**.
6. Provide all items indicated within 274116 – Audio Visual Systems Specification except as excluded and to be provided by **Electrical Contractor.**
7. **Audio-Visual Contractor (AVC)** to provide Start Up, Functional Testing, and Commissioning reports of all equipment and software: to be submitted as written reports.
   a. Include Electrical Contractor's Approved Test Reports for Data Cables with final commissioning report.

1.12 CONTRACT 8 – FURNITURE CONSTRUCTION WORK (Also referred to as: "Furniture Contractor" or "FC")

A. The Work of the Furniture Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Site Construction Work.

   a. Drawings:
      1) All "FF" (Furniture) Series Drawings for Furniture indicated to be provided by "XYBIX".
      2) For Coordination purposes:
         a) Review Architectural "A", Telecommunication "TN", "TA" (Audio-Visual), and "E" (Electrical) Drawings for coordination of Floor box and Device Locations that are to be integrated with Furniture.
         b) Review All "A" (Architectural), "LS or A" (Life Safety Drawings), "S" Structural, "M" (Mechanical), "E" (Electrical), "P" (Plumbing), "FP" (Fire Protection), "TN" (Telecommunications), "TY" (Security), "TA" (Audio-Visual) series drawings as it relates to the work of this contract.
      3) All "G" or "T" (General) and "A-050" (Life Safety Drawings)
   b. Specifications:
      1) Division 0 – Procurement and Contracting Requirement, all Sections.
      2) Division 1 – General Requirements, all Sections
         a) Include all Contractual Requirements indicated in AIA 132 Contract and AIA 232 General Conditions.
         b) Payment, Performance, and Bid Bonds to be excluded from Fire Alarm and Security Contract.
      3) Divion 12 – Section 125000 – Furniture by Others.

B. **General Requirements for Furniture Contractor**:

1. Provide Owner Training of Furniture Installation with a minimum of (1) 2-Hour Training Session(s).
2. Warranties and Maintenance Schedules to start the date of Substantial Completion and extended for incomplete equipment or systems identified during Substantial Completion Inspection.
3. **Furniture Contractor** to provide Assembly Quality Control reports of all furniture assembled: To be submitted as written reports.
4. **Furniture Contractor** to provide Coordination / Dimensioned Shop Drawings as needed to provide proper layout of floor boxes referencing Architectural Column Lines.

C. **Furniture Scope of work between Furniture Contractor, General Contractor, Electrical Contractor, and Owner:**

1. **Furniture Contractor** to provide: Shop Drawings, Coordination Drawings, and Product Submittals to **Electrical Contractor** for all work relating to the electrical or low voltage scope of the Furniture Work.
    a. **Furniture Contractor** to provide Coordination Drawing information per 013115 Coordination between Multiple Prime Contractors for Fire Alarm and Security work.
2. **Furniture Contractor** to provide all Furniture indicated as by "XYBIX" on "FF" Drawings.
3. **Owner** to provide all Furniture indicated as by "OWNER" on FF Drawings.
4. **General Contractor** to provide all other Casework, Cabinets, and Furniture indicated on Architectural Drawings.
    a. See items tagged as "Y" under GC on Architectural "A" Elevation Drawings for additional information.
5. **Furniture Contractor** to provide Internal Connection Hub for Electrical Contractor to Terminate Telecommunications wiring to with exception to data lines shown to run directly to devices on furniture.
    a. Furniture Contractor to review "TA" Drawings for Audio-Visual Devices.
    b. Furniture Contractor to review "TN" Drawings for Telecommunications Wiring.
6. **Electrical Contractor** to provide Data/Telecommunications wiring for connection to Furniture Communication Hub(s) as shown on Electrical/Furniture Drawings.
7. **Electrical Contractor** to provide outlets mounted in "XYBIX Furniture" and wiring from Floor Boxes outlets to outlets Mounted in "XYBIX" Furniture as shown on Electrical Drawings.
8. **Furniture Contractor** to exclude all work specifically provided by **Other Contractors.**
9. **General Contractor** to exclude all work specifically provided by **Furniture Contractor.**

END OF SECTION 012200

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 14 00

WORK RESTRICTIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section specifies restrictions on the Contractor's use of the premises and requirements for continued Owner occupancy and Owner occupancy of the Project before Substantial Completion

1.2 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to areas dictated by the Owner or indicated on the Drawings. Refer to Sheet T-006 Logistics Plan

2. Occupancy: Allow full access for Owner vendors and occupancy in accordance with various Milestone Turnover dates.

3. 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. Schedule deliveries to minimize use of driveways and entrances. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.3 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Upon completion of all work and issuance of a certificate of completion, the Owner will exclusively occupy the building and site. Any work required for any reason beyond completion will need to be directly scheduled around the Owner’s daily program.

B. Partial Owner Occupancy: The Owner and or the owner’s vendors reserve the right to occupy portions of the building and site to facilitate Commissioning, Radio Tower, Furniture, IT and AV related work in completed or partially completed areas of the building or site before Substantial Completion. Such placement of owner provided items listed above shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

2. Obtain a Certificate of Occupancy from Authorities Having Jurisdiction before Owner occupancy.

3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01140

SECTION 01 21 00

ALLOWANCES

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 administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the contractor.

B. Types of allowances include the following:

1. Contingency Allowances.

1.3 SELECTION AND PURCHASE

A. At Owner, Architect or Construction Manager's request, provide proposals for additional work for evaluation by the project team per section 1.4 below.

1.4 SUBMITTALS

A. Submit proposals for additional work with complete back up for the cost including labor, equipment, materials, sub-contractors, freight and delivery required to perform work requested and in accordance with Section 012600.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each request.

C. Submit Time & Material sheets for each day additional work is being performed.

D. Coordinate and process submittals necessary for additional work in the same manner as all other portions of the work.

1.5 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Construction Manager and Architect for Owner's purposes and only by change documentation that indicate amounts to be charged to the allowance.

B. The Contingency Allowance listed by contract at the end of this section shall be included in the Base Bid. The entire value of a Prime Contractors proposal including costs for labor, materials, equipment, delivery, rentals, Overhead and Profit on any given change in work, will be deducted from the Contingency Allowance.

C. Allowance Authorization Forms: The Construction Manager will distribute and process Allowance Authorizations through Procore Management Software.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by a credit Change Order.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine products covered by an Allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. GENERAL CONSTRUCTION **CONTRACT 1**

1. Allowance No. **GC-A1**: Include a lump sum allowance of **$300,000.00** for use according to the Owner's instructions.

B. PLUMBING CONSTRUCTION **CONTRACT 2**

1. Allowance No. **PC-A1**: Include a lump sum allowance of **$30,000.00** for use according to the Owner's instructions.

C. MECHANICAL CONSTRUCTION **CONTRACT 3**

1. Allowance No. **MC-A1**: Include a lump sum allowance of **$100,000.00** for use according to the Owner's instructions.

D. ELECTRICAL CONSTRUCTION **CONTRACT 4**

1. Allowance No. **EC-A1**: Include a lump sum allowance of **$150,000.00** for use according to the Owner's instructions.

E. SITE CONSTRUCTION **CONTRACT 5**

1. Allowance No. **SC-A1**: Include a lump sum allowance of **$150,000.00** for use according to the Owner's instructions.

END OF SECTION 012100

SECTION 01 22 00

UNIT PRICES

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 administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Authorization to proceed with Unit Price work must be provided by the Construction Manager or Architect. Unauthorized work will not be paid for.

B. The Contractor must provide Construction Manager 24 hours advanced notice when performing work utilizing a unit price. The contractor must accurately record quantities and report them daily when said work is being put in place. Failure to accurately track and communicate installed quantities may result in an omission of installed quantities.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. Unit prices include all necessary material, labor, equipment, cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

E. Measurement and Payment: **Each Unit price will be directly correlated and derived by the provided quantity** in the Schedule of Unit Prices under Part 3 of this section. The provided quantity shall be carried in the Contractors' **Base Bid**. The actual documented quantity may be more or less than the provided Bid quantities indicated in the Schedule of Unit Prices. Upon completion of Unit Price related work, the Contractor shall submit all documentation to the Construction Manager for review and evaluation and a corresponding adjustment modification to the contract resulting in either an Add or Deduct change order to the contract amount will be made.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price **SC-UP1**: Removal and Disposal offsite of **500 US TONS** of contaminated soils and replacement with satisfactory soil material.

1. This Unit Price pertains to Contaminated Soils identified on the property located to the south of the development area. The soil identified in these three (3) locations will require offsite disposal to a facility which is licensed and permitted to accept the material. Complete soil removal and disposal in accordance with the procedures within Appendix C, Remedial Action Work Plan and reference Figure 13 as provided by CT Male Associates for locations. Figure 13 is attached to the end of this section.

2. The Site Contractor shall understand this remediation will be a process over multiple days to allow for testing of soil after initial excavation and potentially needing to excavate further until soil is below acceptable limits. Upon acceptable test results the excavation should be backfilled and stockpiled contaminated soils shall be disposed of offsite.

3. This work will be scheduled as directed by the Construction Manager between the months of May and October of 2025.

4. Replacement with satisfactory fill material or engineered fill from off-site, as required, in accordance with Section 312000 "Earth Moving."

5. Unit of Measurement: Cost for all work including but not limited to excavation, stockpiling, protection, haul off, disposal and backfill per **US Ton** as measured by the accepting permitted facility and reported on the trucking manifests.

B. Unit Price **SC-UP2**: Installation of **1,380 Linear Feet** of Geothermal Steel Well Casing.

1. This unit price pertains to the overall installation of steel well casing for the Geothermal Well field. The total linear feet of well casing used on any given well may differ from another. Each drilled well shall document the casing used and agreed upon with the Construction Manager.
2. Unit of Measurement: Cost for labor, material and equipment used to install **Linear Feet** of well casing.

3.3 ATTACHMENTS:

A. Figure 13 Provided by CT MALE ASSOCIATES

END OF SECTION 012200

FIGURE 13 - CT MALE ASSOCIATES

012200.1 SC-UP1

SECTION 01 25 00

SUBSTITUTION PROCEDURES

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 administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailabilityof required warranty terms.

2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer an advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers andtitles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate the proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 EXECUTION (Not Used)

END OF SECTION 0012500

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1. The provisions of this section apply to the work of each Prime Contract.

1.3 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Additional Work: The Prime Contractor shall not under any circumstances perform any work outside the contract sum that incurs additional costs without notifying the Architect and Construction Manager and receiving corresponding directive to proceed with the presumed additional work.

B. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider a proposal request as instructions either to stop work in progress or to execute the proposed change.

2. Within seven (7) days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. Include any potential equipment and material lead time.

3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. All quotations shall be accompanied by a complete itemization of net costs, including labor (type,

quantity, and complete rate breakdown per hour), equipment both owned (in accordance with Blue Book rates) or rented (per the actual invoice) and material (type, quantity and unit cost). Copies of written quotations from subcontractors and suppliers itemized in the same manner. Include any related drawings, sketches, photographs etc.

4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

5. The format of all the above costs should be subtotaled and followed by overhead and profit for Prime Contractor and or subcontractor as applicable then provide a TOTAL at the end of the proposal. There will be no increase for bond premium until the end of the project upon completion of all work.

6. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

7. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change along with potential equipment and material lead time. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. All quotations shall be accompanied by a complete itemization of net costs (excluding overhead & profit), including labor (type, quantity, and complete rate breakdown per hour), equipment both owned (in accordance with Blue Book rates) or rented (per the actual invoice) and material (type, quantity and unit cost). Copies of written quotations from subcontractors and suppliers itemized in the same manner. Include any related drawings, sketches, photographs etc.

3. Indicate applicable taxes, delivery charges, and amounts of trade discounts.

4. The format of all the above costs should be subtotaled and followed by overhead and profit for Prime Contractor and or subcontractor as applicable then provide a TOTAL at the end of the proposal. There will be no increase for bond premium until the end of the project upon completion of all work.

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

D. All Prime Contractor Proposals will be submitted to Procore per the Procore Master Instructions.

1. Procore will automatically generate a form which requires specific fields to be filled in inclusive of proper PCO number, Title, Description, cost fields and the attachment field to upload Contractor's PCO with all supporting documentation.

E. Time & Material initiated Proposal Requests: The Construction Manager or Architect may authorize additional work to be completed on a Time & Material (T&M) basis or a Time & Material Not to Exceed basis. The Prime Contractor shall be responsible to provide a daily accounting (T&M ticket) indicating the date, description of work and quantities of labor, materials and / or equipment used to perform the work. This daily accounting must be presented to the Construction Manager daily for signature to verify the quantities listed.

F. Overhead and Profit (OH&P): A Prime Contractor and their subcontractor(s) will be authorized to include overhead and profit applied to Change Order work as follows.

1. Additional Work self-performed by a Prime Contactor will be allowed a maximum of fifteen percent (15%) combined OH&P on sub-totaled net cost of additional work.

2. Additional Work performed by subcontractors or multiple-tier subcontractors to a Prime Contractor will be allowed a total maximum of fifteen percent (15%) on sub-totaled net cost of additional work. An additional five percent (5%) OH&P for the Prime Contractor on the net cost of subcontracted work for a total maximum of twenty percent (20%) Overhead and Profit.

3. Change Orders containing both additional and deduct work items will result in the overhead and profit being applied to the net increase cost.

1.5 CONTINGENCY ALLOWANCE

A. The Construction Manager and/or the Architect will determine if a received and negotiated contractors' proposal will be processed as an Allowance Disbursement from the Prime Contractors contingency allowance. The Prime Contractor's cost for material, equipment, delivery, unloading, storage, handling and installation, and labor shall be included in the value of the contingency allowance authorization.

~~B.~~ Overhead and Profit (OH&P) costs including costs of bonds, insurance, administrative and supervision are to be included in the Base Bid. This includes Subcontractor OH&P for work performed by subcontractors and multi-tier subcontractors~~.~~

C. Contingency Allowance Adjustment: To adjust allowance amounts, base each Allowance Disbursement upon the written authorized amount of the Construction Manager and or the Architect.

1. Prepare explanation, documentation and itemization to substantiate distribution of costs claimed.

a. Submit invoices and delivery slips to show actual quantities of materials delivered to site for use in fulfillment of each allowance.

2. The owner or their representatives reserves the right to establish the quantity of work in place by independent quantity survey, measures, or counts.

D. The Construction Manager/Architect will create Allowance Disbursement forms through Procore Management Software.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Construction Manager and or the Architect will issue a Change Order for signatures of Architect, Construction Manager, Owner and Contractor on the Change Order form.

1. All quotations shall be accompanied by a complete itemization of costs, including labor (type, quantity and unit cost per hour), materials (type, quantity and unit cost) and copies of written quotations from subcontractors and suppliers itemized in the same manner.

a. Overhead shall be deemed to include the cost of insurance, and similar contract requirements.

b. Indicate applicable delivery charges, equipment rental, taxes and amounts of trade discounts.

2. The combined overhead and profit included in the total cost to the Owner shall follow proceeding section 1.4F of this specification section.

3. Performance and Payment Bond Adjustments: Do not itemize increased bond premiums for each individual Change Order per General Conditions of the Contract.

B. The Construction Manager will create Change Order forms through Procore Management Software.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner or their representatives and Prime Contractor are not in agreement on terms of a Proposal Request, the Construction Manager or Architect may issue a Construction Change Directive via an email or letter clearly stated. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates a method to be followed to determine change in the Contract Sum or the Contract Time.

B. Prime Contractor Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary, or as requested by Architect or Construction Manager, to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 012600

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.

2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittal Schedule.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by the Prime Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Forms: Each Prime Contractor will be provided with a form with instructions by the Construction Manager to properly integrate into Procore Management Software.

B. Coordination: Each Prime Contractor shall coordinate preparation of its Schedule of Values for its portion of the Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets

b. Submittal Schedule

c. Material / Equipment status report

d. Contractor's Construction Schedule

2. Submit the Schedule of Values to the Construction Manager at earliest possible date but no later than fourteen (14) days before the date scheduled for submittal of initial Application for Payment.

C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section including but not limited to, those indicated within Prime Contract scope under Division 01 Section "Multiple Contract Summary".

1. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide several line items for principal subcontract amounts, where appropriate and as indicated.

2. General Requirements shall be broken down in the Schedule of Values in separate line items as follows:

a. Project Insurance – Actual Invoice Amount.

b. Performance & Payment Bonds – Actual Invoice Amount.

c. Mobilization value limited to 1.5% of the Contract Sum.

d. Temporary Facilities and Controls – Break out into sub items as needed.

e. Field Supervision – Minimum of 3% of Contract Sum.

f. Project Management & Administration - Minimum of 2% of Contract Sum.

g. Submittals and Shop Drawings – Minimum of 1% of Contract Sum.

h. Safety and Field Reports - Minimum of 3% of Contract Sum

i. Coordination / Coordination Drawings - Minimum of 1% of Contract Sum.

j. Project Schedule – Minimum of 1% of Contract Sum.

k. Meeting Attendance - Minimum of 1% of Contract Sum.

l. Testing and Balancing (if included in Contract) - Minimum of 2% of Contract Sum.

1) Punchlist - Minimum of 1% of Contract Sum – Not to be paid until the Substantial Completion Inspection Report is issued and Punchlist Work is being completed.

2) Final Demobilization – Minium of 0.5% of Contract Sum

3) Final Professional Cleaning (GC Package) – Minium of 0.5% of Contract Sum

4) Project Closeout – Total Value to be not less than 1% of Contract Sum

(a). Operation and Maintenance Manuals

(b). Warranties

(c). Project Record Documents

(d). Demonstration and Training

3. Provide line items for each applicable specification section. Where a large value for a single specification section occurs, the prime contractor may be required to break values down further as requested by the Construction Manager and / or Architect.

4. Round amounts to the nearest hundred dollars ($100); total shall equal the Contract Sum.

5. Itemize separate line-item cost for work required by each basic activity or operation by specification numbers.

   a. Each line-item cost shall be separated into Labor and Material.

6. Provide separate line items for Specification Sections that have construction that can be identified as a separate system, like structural steel, that will have separate line items for,

   a. Anchor Bolts

   b. Columns & Beams

   c. Loose lintels

   d. Miscellaneous Steel

   e. Fabrication

7. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include progress payments for materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing specific to the items being invoiced both in description and dollar value as required.

   b. Prime Contractor shall designate which line items in the SOV are materials stored on or off site and equal to but not more than the dollar value indicated within supplier invoices for provided materials as required for payment.

8. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

9. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit

cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

10. Alternates: Each Alternate shall be separated into separate line items that total the value of the Alternate indicated on bid day. Larger Alternates may require extensive breakdown as directed by the Construction Manager and / or Architect.

11. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general conditions, overhead, and profit for each item.

12. After review by the Construction Manager, Architect, and Owner, revise and resubmit Schedule of Values if required as many times as necessary to satisfy the Construction Manager, Architect, and Owner.

D. Schedule of Values Timeframe:

1. Submit initial Schedule of Values within fourteen (14) days of a Notice to Proceed.

2. Revise & Resubmit for Approval as required but no less than ten (10) days prior to the first Application for Payment. Payment will not be made without an Approval.

3. The Construction Manager will update each Prime Contractors Schedule of Values to include approved individual Allowance Disbursements drawn down from the Contingency Allowance. Additionally, the Construction Manager will update each Prime Contractors Schedule of Values to include all approved Change Orders or Construction Change Directives that result in a change in the Contract Sum. All adjustment to a Schedule of Values will be processed by the Construction Manager through Procore management software.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Construction Manager, Architect and paid for by Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal for the first Application for Payment include the following. The initial payment application will not be processed until all action submittals have been received by the Construction Manager.

1. Approved Schedule of Values

2. List of principal consultants and staff assignments working on the project

3. Site Specific Safety Program including Emergency Contracts

4. List of Subcontractors, Suppliers, and Major Products to be purchased
5. Payment & Performance Bonds Approved by the Owner
6. Certificate of Insurance meeting the requirements of the contract documents Approved by the Owner
7. Contractors Construction Schedule
8. Complete Submittal Schedule including any Substitutions

C. Payment-Application Times: The Submission of each Application **pay period** will begin with a Draft Application review on the 20th and end with a signed Executed Application submitted on the 30th day. ~~of each month~~ (or as designated by the Owner).

1. This date is the basis of the cycle time, and shall be confirmed at the Pre-Construction Conference, based on the owner's requirements for processing Applications for Payment. The owner reserves the right to adjust this sequence, if necessary, with payments executed net 30 days.

D. Payment-Application Forms: Each Prime Contractor will enter Payment Application values requested for each line item of work completed into **Procore** Management software provided by the Construction Manager.

1. Each Prime Contractor shall follow the specific instructions for entering payment values. Upon completion of entry activate the "Start" workflow. The review period by the Construction Manager, Architect, and Owner will then begin and all review comments will be provided and logged within Procore.
2. Upon completion of the application review, Prime Contractor shall make necessary adjustments and prepare application for execution.
3. During the application review period, if the Construction Manager, Architect, or Owner deem work put in place to be deficient and unacceptable, the contractor will be directed via a Deficiency Report and or Notification directing the contractor to correct the work. If the deficiency is unable to be corrected prior to the payment period closing, the Construction Manager, Architect, or Owner reserves the right to minimally withhold (2) Two times the value of the deficient item(s) inclusive of removal and reinstallation of the work. The value shall also cover the cost for an outside contractor to complete the deficient work if Prime Contractor does not comply within (15) fifteen days.

E. Application Preparation: Each Prime Contractor shall follow instructions provided by the Construction Manager to~~.~~ Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action. The entire Application for Payment process will be electronically administered through Procore Management Software.

1. Entries shall match data on the Approved Schedule of Values.

2. Provide updated Construction & expected Material Schedules with each application. Additional Two Week Look Ahead schedules shall be supplemented in between overall Construction Schedule updates and will be required for payment distribution.

3. The Construction Manager will include any Approved Change Orders, Allowance Disbursements and Construction Change Directives issued prior to the last day of the construction period covered by the application.

F. Certified Payrolls: Provide copies of certified payrolls (including subcontractors) that are signed and notarized, documenting compliance with prevailing wage laws for the construction period covered by the application.

1. In accordance with Article 8, Section 220 of the New York State Labor Law, every contractor and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:

   a. Name

   b. Classification(s) in which worker was employed

   c. Hourly wage rate(s) paid

   d. Supplements paid or provided

   e. Daily and weekly number of hours worked in each classification

2. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of it's first payroll and every thirty (30) days thereafter, a transcript of the original payroll, subscribed and affirmed as true under penalty of perjury.

G. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from every entity who is lawfully entitled to file a mechanics lien arising out of the contract and related to the work. This includes subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Lien Waiver forms acceptable for use on this project will be provided to each Prime Contractor for use and distribution to subcontractors and suppliers.

2. Each Prime Contractor must include with each application for payment the current up to date list of all subcontractors and suppliers. Additionally, indicate which subcontractor and supplier lien waivers are included with respect to the updated list.

3. Submit partial waivers on each item for the amount requested to be paid and the amount paid from previous application, after deduction for retainage, on each item.

4. When an application shows completion of an item, submit final or full waivers.

5. The Construction Manager, Architect, and Owner reserve the right to request additional substantiating data and designate which entities involved in the Work must submit waivers.

    a. Submit final monthly Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

H. Application for Payment at Substantial Completion: Each Prime Contractor must request, in writing, an inspection for Substantial Completion to the Construction Manager, Architect, and Owner. Following assurance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include:

    a. Occupancy permits and similar approvals

    b. Warranties (guarantees) and maintenance agreements

    c. Operation and Maintenance instructions / manuals

    d. Start-up performance reports

    e. Test/adjust/balance records

    f. As built and or Record Drawings

    g. Meter readings (if applicable)

    h. Change-over information related to Owner's occupancy, use, operation and maintenance

    i. Final cleaning

    j. Application for reduction of retainage and consent of surety (AIA G707a)

    k. Advice on shifting insurance coverages

    l. Final progress photographs

    m. List of incomplete Work and associated value of said work, recognized as exceptions to Architect's Certificate of Substantial Completion

    n. The Construction Manager, Architect, and Owner reserve the right to withhold two times (2x) the value of incomplete work.

I. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Evidence of completion of Project closeout requirements including all "Attic" / "Extra" stock or "Maintenance Materials" have been turned over to the Owner via executed Transmittal.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Ensure that incomplete Work is not accepted and will be completed without undue delay.
10. Transmittal of required Project construction records to the owner
11. Proof that taxes, fees, and similar obligations were paid
12. Removal of temporary facilities and services
13. Removal of surplus materials, rubbish, and similar elements
14. Change of door locks to Owner's access.

J. Final Payment will not be made unless all items in section "I" above are completed and approved.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Procore Management Software
2. General project coordination procedures.
3. Special Reports.
4. Requests for Interpretation (RFI)
5. Coordination Drawings.
6. Administrative and supervisory personnel.
7. Project meetings.

B. Each Prime Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3 DEFINITIONS

A. RFI: Request For Information – from Contractor seeking interpretation or clarification of the Contract Documents.

B. Coordination Drawings: Show relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1.4 PROCORE MANAGEMENT SOFTWARE

A. This project will utilize Procore Management software for all aspects of the project including but not limited to:

1. Contractor Initiated Items:

a. Submittals

b. Requests for Information (RFI's)

c. Project Schedule & updates

d. Two Week Look-Ahead Schedules

e. Contractor change proposals

f. Payment Applications

2. Constrution Manager and Architect Initiated Items:

a. Architects contract document clarifications

b. Prime Contractor proposal Requests

c. Field Observation Reports

d. Construction Deficiency Reports

e. Substantial Completion Inspection / Punchlist

f. Processing Allowances and or Change Orders

g. Payment Applications

3. Prime Contractors are required to follow the Procore Master Instructions which will be provided electronically to each Prime Contractor. Additionally, the Construction Manager will assist contractors as needed.

a. Prime Contractors will be responsible to acknowledge, accept, and confirm receipt of all Construction Manager and or Architect initiated items.

1.5 COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Project meeting attendance shall facilitate open communications.

2. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation. At no time should a contractor prevent another contractor from installing their work.

3. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair including mechanical and electrical.

4. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

2. Each Prime Contractor shall prepare and distribute a "TWO WEEK LOOK AHEAD" Schedule (TWLAS). The TWLAS shall at a minimum be updated and distributed weekly at coordination or project meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.

3. Processing of Coordination drawings.

4. Installation and removal of temporary facilities and controls.

5. Delivery and processing of submittals.

6. Progress meetings.

7. Preinstallation conferences.

8. Startup and adjustment of systems.

9. Daily Cleaning and protection.

10. Project closeout activities.

D. Conservation: Each Prime Contractor shall coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Provide material and waste recycling methods.

1. Salvage materials and equipment involved in the performance of, but not actually incorporated into, the Work.

1.6 SPECIAL REPORTS

A. General: Submit special reports to the Construction Manager within one day of an occurrence. Submit a copy of the report to the Architect and any other entities affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual or significant nature occurs at the site, the Prime Contractor shall prepare and submit a special report. The report shall list data, observations of chain of events, persons affected, and participating response by Prime Contractor's personnel and similar pertinent information. An example of a special report could be due to an accident or incident, something discovered etc.

1.7 REQUEST FOR INTERPRETATION (RFI)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with the Prime Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following submitted on the **Procore electronic form**:

1. Project name.

2. Date.

3. Name of Contractor.

4. Name of Architect.

5. RFI number, numbered sequentially.

6. Specification Section number and title and related paragraphs, as appropriate.

7. Drawing number and detail references, as appropriate.

8. Field dimensions and conditions, as appropriate.

9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

10. Contractor's signature.

11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

    b. Attachments shall be electronic files in Adobe Acrobat PDF format.

C. Architect and Construction Manager Action: Architect and Construction Manager will review each RFI, determine action required, and return it. Allow five (5) working days for Architect's response for each RFI. RFIs received after 3:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.

    b. Requests for approval of substitutions.

    c. Requests for coordination information already indicated in the Contract Documents.

    d. Requests for adjustments in the Contract Time or the Contract Sum.

    e. Requests for interpretation of Architect's actions on submittals.

    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

3. Architect's action on RFIs that may result in a change to the Contract Time, or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within ten (10) days of receipt of the RFI response.

D. On receipt of Architect's and Construction Manager, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven (7) days if Contractor disagrees with response.

1.8 COORDINATION DRAWINGS

A. General: The Contract Drawings are diagrammatic in nature; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Where possible, the Contractor shall take field measurements and verify field

conditions and shall careful compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable.
    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate required installation sequences.
    c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Refer to Specification Section 013115 and other individual Specification Sections for Coordination Drawing requirements for work in those Sections.

1.9 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: Each Prime Contractor is to provide a Non-working Project Superintendent with decision making authority.

B. Supervision: Each Prime Contractor's project manager and field superintendent throughout project duration shall have five (5) years of experience minimum in the proposed position.
    1. Two (2) years of the five years of experience for the position shall be with Prime Contractors firm.

C. Should the project managers or superintendents prove unqualified for the position at any point in the project, the Construction Manager shall issue a letter or email stating that the person is to be removed from involvement in the project.
    1. Action must be made by the Prime Contractor within seven (7) working days of receipt of such correspondence.

D. Staff Names: At the Pre-construction Conference each Prime Contractor shall submit a list of principal staff assignments, including superintendent and other personnel in attendance at project site. Identify individuals and their duties and responsibilities. List business addresses and telephone numbers, including business office, field office, and cellular.

1.10 PROJECT MEETINGS

A. General: The Construction Manager shall Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Architect / Construction Manager will schedule a preconstruction conference before starting construction, no later than fifteen (15) days after execution of the Agreement. The purpose of the meeting is to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, Construction Manager, and their consultants; each Prime Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing.
d. Designation of responsible personnel.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for processing Applications for Payment.
g. Distribution of the Contract Documents.
h. Submittal procedures.
i. Preparation of Record Documents.
j. Use of the premises.
k. Responsibility for temporary facilities and controls.
l. Parking availability.
m. Office, work, and storage areas.
n. Equipment deliveries and priorities.
o. First aid.

p. Security.
q. Progress cleaning.
r. Working hours.

3. Each Prime Contractor shall submit the following items at this meeting:
   a. Contractor's Construction Schedule
   b. List of Subcontractors.
   c. Schedule of Values.
   d. Submittal Schedule.
   e. Products List (Proposed products and manufacturers including any substitution products proposed).
   f. Labor rate sheets; provide for each trade classification of Prime Contract workforce.

C. Preinstallation Conferences: When required in the individual Specification Section, conduct a Preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates in advance.

2. Contractor shall prepare agenda, preside at conference, record minutes, and distribute copies after conference to participants. Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   d. Purchases.
   e. Deliveries.
   f. Submittals.
   g. Review of mockups.
   h. Possible Conflicts.
   i. Compatibility problems.
   j. Time schedules.
   k. Weather limitations.
   l. Manufacturer's written recommendations.
   m. Warranty requirements.

n. Compatibility problems.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: The Construction Manager will conduct progress meetings at prescheduled weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. The Construction Manager will preside over these meetings.

2. Attendees: In addition to representatives of Owner, Construction Manager and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

1). Adjust list below to suit Project.
2). Interface requirements.
3). Sequence of operations.

4). Status of submittals.
5). Deliveries.
6). Off-site fabrication.
7). Access.
8). Site utilization.
9). Temporary facilities and controls.
10). Work hours.
11). Hazards and risks.
12). Progress cleaning.
13). Quality and work standards.
14). Change Orders.
15). Documentation of information for payment requests.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: The Architect / Construction Manager will conduct coordination meetings at prescheduled intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1). Interface requirements.
2). Sequence of operations.
3). Status of submittals.
4). Deliveries.
5). Off-site fabrication.
6). Access.
7). Site utilization.
8). Temporary facilities and controls.
9). Work hours.
10). Hazards and risks.
11). Progress cleaning.
12). Quality and work standards.
13). Change Orders / CFA's.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 013100

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 31 00.01 -- PROCORE MASTER INSTRUCTIONS

The Palombo Group

Procore Instructions

Revision #4 - 05/29/2024

If there are any questions, send an email to the TPG Superintendent or Project Administrator for guidance.

Table of Contents

Contents

GENERAL INFORMATION

Best Practices for all users:

- If there are any questions or issues with any of the Tools in Procore, contact the **TPG Project Administrator or TPG Superintendent** assigned to your Project.
- For quick questions, Procore **Live Chat** is also available to assist with resolving issues.
- All items must be uploaded with the **correct numbering** per Trade: EX: GC-01, MC-23, etc.
- All PDF documents must have all pages uploaded in the correct **orientation** for all items in Procore. **PDFs cannot be rotated** once uploaded to Procore.
- As questions come up, new processes starting, or new users are being brought into Procore, instructions sections shall be cut/pasted + included in emails for clarification purposes.

PROCORE DIRECTORY TOOL– IMPORTING USERS

Contractor/Architect/Owner/Consultant Instructions: Collecting required User & Company/Vendor Information:

Contractor/Architect/Owner/Consultant Instructions: Collecting/reviewing required User & Company/Vendor Information:

1. **Three forms** to be filled out, one is for individual **users**, one is for **companies/vendors** (Contractors, Owners, Architect w/ Consultants), one is for role information per **"PROCORE START UP COVERSHEET"** form.
    a. These are sent out to every entity on the project via email request, then filled out and emailed back to TPG.
2. **For the company form, the Prime Contractor only needs to fill out one row for their own company information.** It's not for Subs or Companies that are not Prime Contractors, Architects, Consultants or Owners. The company **name (legal name)** in the **company/vendor form** would need to cross reference between the company name on the **user form,** this must match exactly.
3. Red and Orange columns are the critical columns and green columns are for referencing/sorting but don't affect the configuration, gray columns do not get filled out by contractor.
4. **State** needs to be 2 characters (Ex: NY) and **Country**: "United States" per below.
5. **All Phone Numbers** need to be typed in the following format: 000-000-0000.
6. TPG will fill out the "**Permission Template**" column in the gray column by cutting and pasting the types per instructions, then on the user template, select "is employee" column as "no".
7. **Each Company is to have submitted the "PROCORE START UP COVERSHEET"** form, which is to supply role information, Invoice Contacts, Notifications List, and Primary Points of Contact.
    a. **Each entity** will have to tell TPG who the **Invoice/Payment Application Contacts** are for sending in and reviewing Pay Apps/Invoices.
    b. **Each entity** will have to tell TPG who the **Primary Project Management Contacts** are for Correspondence.
    c. The Contractor can provide a **"foreman"** user to give "limited read only access" to the Drawings/RFI's/etc. but can still respond to punchlist items and no financials access. The Contractor to provide a list of these users.
8. Once TPG imports the users to Procore, the Procore Directory Tool can be used to view contact information for all users on the Project.

PROCORE SUBMITTALS TOOL

Optimize the view of the Submittal Tool / Log upon first use.

1. SUBMITTALS: Open "Submittals" under "Tools".
    a. Set up of the viewing window of the Log:
        i. Open the Submittal Log in the Submittal Tool to view open submittals in each Contractor's Court / Responsible Contractor. **"Spec Section"** view is recommended instead of "Item View".
        ii. Set up Column Headers per user preference use vertical "…".
            1. Turning off Columns: Approvers, Response, Sent Date, and Returned Date will show the log in a more compact view.
        iii. Resize columns as needed.

Using Filters to locate specific submittals:

1. Filters can be applied to sort Submittals by Status, Spec Section/Submittal Number, Responsible Contractor, or Ball in Court
2. Select "add filter", select filter, then select the items to view.
3. "Clear All" will remove all filters.

Closeout Submittal Package Instructions:

1. A Submittal Schedule of all submittals including closeout submittals must be submitted and approved by the Architect/CM prior to submitting the final Closeout Package.
2. Each Item is to be submitted individually as separate submittals and approved on the submittal coversheets prior to assembling the final package.
3. Once all items on approved submittal schedule are approved, assemble files into Final Package Zip File containing:
    a. O&M's (separated by spec section) (with copy of Record Documents and Warranties)
    b. Dedicated Record Documents (Contains Record Shop Drawings, Contract Drawings / Spec's)
    c. Dedicated Warranty Package, to include the Project specific warranty information including start/end dates and provide provisions for Owner to make warranty claims directly.
4. PDF files in the package to be labeled to include the Submittal Number, Type, and Description.
5. Include a numbered table of contents that directly cross references to all PDF files in the package. Attach a submittal coversheet for the entire package. The Table of Contents should correlate with the items on the Approved Submittal Schedule.

Viewing the Submittal Log / Report:

1. Open "Procore **Reports** Tool" in "Project Tools"
2. Under " Assigned Reports" select: Submittal Log (Project Level)
3. The Submittal Log will be visible. Horizontal Scroll Bar at the bottom of the page.
4. Select "Add Filter" to filter by **Contractor**, **Status, Ball in Court, or Spec Section Number**
        i. See below info on statuses to view all open submittals with filters.
        ii. To view **only the open submittals**, select filters to view under **status**:
            1. Closed & Provide Additional Submittal
            2. Open
            3. Open w/ AE
            4. Open w/ Contractor
            5. Revise and Resubmit (Open)
5. Select "Export" button in the upper right corner and select "PDF" or "PDF with Visuals."

Contractor Submittal Instructions:

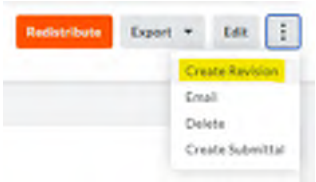
Create a submittal as a Contractor.

1. Review Procore instructions: https://support.procore.com/products/online/user-guide/project-level/submittals/tutorials/create-a-submittal
2. If a Revised Submittal is being submitted, follow instructions below for "Create a REVISED SUBMITTAL from a previously created Submittal as a Contractor."
3. For new Submittals: Click **"Create" -> "Submittal"** in the Submittal Tool.
4. Enter a **Title** for the Submittal. If applicable, indicate location in Title.
    a. Title Naming convention should include specific information like Submittal Type, Equipment Tags, etc.
5. Select the correct **Spec section**. If spec section can't be found or if there is a question, contact TPG.
6. The **Submittal Number** will auto generate the next number in the sequence.
    a. **Numbering convention** is (Section #) – (Submittal # within that section)
7. Select the correct **Submittal Type**, see end of sheet for submittal type descriptions to select the correct option.
8. Select your company as the **Responsible Contractor**.
9. Select the TPG Project Super as the **Submittal Manager**.
10. Submittal **Status** to be "Open".
11. The **Distribution List** would be the Prime Contractor creating the submittal and the CM Group. This is so the users listed will receive an email notification when a submittal is closed.
12. List the approximate material **Lead Time**.
13. **Required onsite date** to be filled out with anticipated delivery date for material.
14. Leave **Private** submittal check box unchecked, unless Submittal contains confidential information (Bonds, Insurance, SOV, Wage Rates, Employee List, Other Front End Documents).
15. Attach the submittal file in the **Attachments.**
    a. Include the Architect Submittal coversheet, make sure the cover sheet is attached to the front of the PDF, completely filled out with Contractor's signature.
16. Enter the date creating the submittal in **Creation Date**.
17. Leave the **Submittal Review Workflow** blank. CM Superintendent to fill this section once received.
18. Click "**Create and Send Emails**".

Create a REVISED SUBMITTAL from a previously created Submittal as a Contractor.

(**Must be the original submitter otherwise create new Submittal with matching Submittal Number**)

1. **"View**" the previous submittal.
2. Select the "vertical ellipses" button, then select create revision.
3. Attach the submittal file in the **Attachments** with updated coversheet.
4. Select the correct **Submittal Workflow Template "0 – CONTRACTOR CREATED"** to clear and update the workflow.
5. Select "**Create and Send Emails**"



Architect/Construction Manager Submittal Instructions:

SUBMITTALS: Open “Submittals” under “Tools”.

Respond to a submittal item:

1. https://support.procore.com/products/online/user-guide/project-level/submittals/tutorials/respond-to-a-submittal-as-an-approver
2. CM Superintendent Step Only:
    a. When a submittal is first received and ready to be sent for review, the submittal must be edited to apply the correct workflow review template. Multiple review templates can be used for specialty consultant reviews, Architect to specify at Project Start.
    b. Steps:
        i. Select “Edit” on the Submittal.
        ii. Scroll to **Submittal Review Workflow Template,** then select the correct review template based on trade.
        iii. Change the Status from “Open” to “Open w/ AE”, then press “Update”
3. Click on the submittal item you are reviewing. Open the previous PDF file submitted in the workflow.
4. Create Mark ups/Text boxes as needed in the Procore PDF tool. Mark up the coversheet in the pdf with final response.
5. Click the “x” to exit the view, pdf is autosaved.
6. Click “Respond”, check that the marked-up attachment is included and select “next”.
    a. If the PDF was marked up and saved in Procore, then the marked-up copy will automatically pull forward. No additional attachment is needed.
    b. If the PDF is sent through as is with no mark ups, the previous pdf will pull forward as is.
    c. If the PDF is marked up outside of Procore, add the attachment to this field to replace the previous attachment.
    d. The Response “Pending” will hold a Submittal until changed.
7. **If an additional review is needed, select forward for review (Ex: consultant review). This will create another review step in the workflow for the reviewer.**
    a. https://support.procore.com/products/online/user-guide/project-level/submittals/tutorials/forward-a-submittal-for-review
8. Select a response code: R&R, AAN, APP, etc. and then select “preview”, then “Respond”.
9. This will send the submittal to the next step in the workflow. If this is the last person in the submittal review workflow, then it will be returned to TPG ready to be closed.

Close a submittal (as CM):

1. https://support.procore.com/products/online/user-guide/project-level/submittals/tutorials/close-a-submittal
2. Open the submittal, then select “Close & Distribute” if the submittal has been fully reviewed.
3. If users are in “CC”(from distribution list), do not duplicate in “To” field, leave blank.
    - Confirm the **Contractor** and the **CM** is in the Distribution List.
4. Select final **Status**. See Submittal Status Description Instructions.
5. Leave “Create revision” unchecked.
6. Select the latest response and the general info.
7. Select next, then select **Distribute**.

Submittal Status Descriptions:

- **Open Statuses:**
  - Closed & Provide Additional Submittal
    - Submittal has been accepted but a separate follow submittal is required.
    - When follow up submittal has been accepted, then change this status to closed.
  - Open
    - Default status when Contractor creates a submittal.
    - Defined as open with Construction Manager.
  - Open w/ AE
    - CM to change status from “Open” to “Open w/ AE” when the submittal has been sent through to the Architect.
  - Open w/ Contractor
    - When a submittal is created by the CM that is due by the Contractor with special workflow.
    - This status is seldom used.
  - Revise and Resubmit (Open)
    - The architect has not accepted this submittal and is requiring a resubmittal.
    - Change this status to “Void, See Revised Submittal” when the revised submittal has been accepted.
- **Closed Statuses:**
  - Closed
    - Submittal has been accepted. No further action required,
  - Rejected, No resubmittal needed.
    - Submittal is not part of project or not applicable and no resubmittal is required.
  - Void, See Revised Submittal
    - When a rejected or R&R submittal has been revised and accepted, then the original rejected submittal is to be changed to this status, so these items are not mixed with the other closed submittals.

Submittal "Type" Descriptions:

- Project Start Submittals:
  - Delegated Design / Calcs: Resubmit shop drawings separately.
  - Product Information: Includes all Product data for that section, if separate components of a section are being submitted, indicated in the Submittal Title.
  - Shop Drawing: If locations are being broken out or if different equipment tags are being submitted, indicate this information in the Title.
  - Sample: Color selection Samples to be submitted separately. If a physical sample is sent, include selection chart in submittal.
  - Start Up (Bonds, Insurance, Qualifications, SOV): For Miscellaneous Project Start up Submittals such as: Bonds, Insurance Packages, W9, SOV, Qualifications Packages, Submittal Schedule, Prime/Sub Wage Rate Package, Contact Lists, PreCon Photos, List of Employees/OSHA cards, Site Specific Safety Plan.
- Mid Project Submittals:
  - QC: Contractor Test Report / Equipment Start Up: Includes either Contractor Field Test Reports (Piping, System, material testing) or Equipment Start Up Reports.
  - Coordination Drawings
    - Discuss coordination process prior to submission (if in Submittal Tool or outside of Procore using BIM modeling).
    - Once all Contractor's accept a coordination drawing, then the drawing must be updated and resubmitted as a separate shop drawing.
- Closeout Submittals:
  - Product Manual
    - Includes all Operations and Maintenance Manuals.
  - Maintenance Material / Attic Stock
    - Signed Transmittals, separated by spec section.
  - Warranty
    - Provide warranties specific to the Project and indicate start date, end date, duration, and provide any information required to make a warranty claim (receipts, invoices; if applicable)
  - Training Documentation: Provide Sign in Sheet and video. Sign in Sheet must indicate start / end times /duration.
  - Record Document / As built: Include Prime Contract Drawings/Specs As-built's as well as updated shop drawings if applicable.
  - Close Out Package (Complete): See "Closeout Package Instructions". For complete packages only containing all O&M's, Record Documents, Warranties, etc.
- Other: For all other unclassified Submittals.
- Not to be used Submittal Types (Procore cannot disable)
  - Document
  - Plans
  - Prints

PROCORE RFI's TOOL

Contractor Instructions:

Create an RFI as a Contractor.

a. Review Procore instructions: https://support.procore.com/products/online/user-guide/project-level/rfi/tutorials/create-an-rfi
b. Click **"Create"** in the top right of the RFI Tool.
c. Enter a **Subject** for the RFI.
d. Enter the RFI **Question** in the question box.
e. Add any additional **attachments** (Drawings, Specs, Photo's, Emails)
    a. A coversheet on the attachment is not required unless the Architect for the Project requires their own cover sheet.
f. Enter the correct **RFI Number** which is contractor specific. EX: GC-01, MC-23, etc.
g. Enter a reasonable **Due Date** (5 business days default) on when the answer is needed by.
h. **RFI Manager** to be TPG Project Super (set by default).
i. Select the TPG Project Superintendent(s)/Project Manager as the first **Assignee**. Do not add Architect yet. Leave all assignees unchecked.
j. The **Distribution List** should be set by default with distribution group "CM". Add any other users/contractors that need to be notified when the RFI is closed.
k. Select your company as the **Responsible Contractor**.
l. Select the applicable **Spec Section**.
m. If an RFI is specific to a location, then select the correct **Location** using the tiered drop-down locations. (Locations must be set up prior for the Project).
n. Select the applicable **Drawing Number**.
o. Identify if there is a **Cost** or **Schedule** impact. If the answer is yes, then a new field will be opened allowing entry of a cost ($) or schedule impact (days).
p. Provide a **Contractor's Proposed Solution**, if not applicable, enter "Not Applicable".
q. Identify **Priority** ("Standard" or "High")
r. Click "**Create as Open**".

Architect/CM Instructions:

Respond to an RFI item:

1. https://support.procore.com/products/online/user-guide/project-level/rfi/tutorials/respond-to-an-rfi
2. Click "view" on the RFI item you are reviewing.
3. Review RFI and any attachments.
4. Select **Add Response** and enter a response in the text box. Add any additional attachments in the attachment field. It is recommended to respond to the RFI directly in text box vs adding additional form if possible.
    1. For the Official Final Response, cut and paste any information/attachments from other responses (consultant's, CM Comments, etc.) into the Final Response for one unified response.
5. If the CM Super is able to close an RFI themselves without additional responses, then proceed to **Close RFI** step. If an additional assignee needs to be added, then proceed to **Add Additional Assignee** step to send to an Architect or Consultant for review**.**

Add Additional Assignee to an open RFI (Send to Architect/Consultant):

1. If CM: Click "**Edit**" on the RFI. If Architect, press "+", then "Forward For Review"
2. If the CM Superintendent is not responding to an RFI and instead deferring to the Architect, then remove the CM Superintendent as an Assignee.
3. **Add in the new assignee(s) (Architect/Consultant).**
4. Leave the new assignee(s) **unchecked for parallel review**.
    a. When an RFI is forwarded to the Architect primary point of contact, their response should be marked required.
    b. When the Architect has all the required responses, the Architect should indicate which response(s) should be marked as the official response as a comment.
5. Click **Save Changes**.

Close an RFI (as CM):

1. https://support.procore.com/products/online/user-guide/project-level/rfi/tutorials/close-an-rfi
2. View the RFI.
3. Verify that all users associated with the RFI are in the **Distribution List**. If multiple CM Superintendents are on a Project, they are to be included as well. Use "edit" to add users.
4. **Mark the Response as Official** as indicated by either the CM or Architect.
5. Select the "**Close RFI"** button to Close and Distribute the RFI.

Viewing the RFI Log / Report:

1. Open "Procore **Reports** Tool" in "Project Tools"
2. Under "Assigned Reports" select: RFI Log (Project Level)
3. The RFI Log will be visible. Horizontal Scroll Bar at the bottom of the page.
4. Select "Add Filter" to filter by **Responsible Contractor**, **Status, or Ball in Court.**
    i. See below info on statuses to view all open submittals with filters.
    ii. To view **only the open RFI's**, select filters to view under **status**: Open.
5. Select "Export" button in the upper right corner and select "PDF" or "PDF with Visuals."

PROCORE REPORTS TOOL (Printable and filterable Logs of Items)

List of available Reports:

1. RFI Log (Project Level)
2. Submittal Log (Project Level)
3. Contract List / Directory (Project Level)
4. List of Specifications (Project Level)
    a. Can be used to assist in creating the Contractor's Submittal Schedule.
5. Potential Change Order Log (Project Level)
    a. For 2 Tier Projects Only.
    b. Costs fields require custom fields feature to be added by Procore at later date.
6. Change Order Log (Project Level)
    a. Includes Allowance Authorizations.
7. Payment Application Status Log (Project Level)
8. Daily Log / Manpower Log (Project Level)
    a. Construction Manager Use Only
    b. Includes Manpower, Inspections, Notes, Dumpster Logs
9. Commitment/Contract Summary (In Commitments Tool)
    a. Located in Commitments Tool -> Export -> PDF Beta. Not located in Reports Tool.
    b. Includes current Contract Amounts, Payments, and Change Orders/Potential Change Orders
    c. Expand Change Order Drop Downs under each commitment to see Change Order's in Log.
10. Other Reports can be generated within their respective Tools by: With Main Page of Tool open, select Export-> PDF.
    a. Includes: Observations, Inspections, Incidents, etc.
    b. Correspondence Tools included. (Use Filter By: Type-> Select Type). (Clarifications, PR's, Schedules, etc.)
11. Outbound Emails Report (Under Canned Project Reports) can be used to diagnose email notification issues. Provides a list of all notification emails sent in a Project.
12. Other Canned Reports are not customized for Construction Management use and should not be used.

General Report Information and Tools:

1. Utilize the filter button to filter reports with parameters such as by: Contractor, Date, BIC, Status, Billing Period, etc.
2. Re-Sort reports by clicking the column headers to sort by the select column.
3. Export the Report as PDF by using export button -> PDF. Excel Files can also be exported.

PROCORE CORRESPONDENCE TOOLS (Schedule, Two Week Look Aheads, PR's/IB's/CIC's/ASI's/ASK's/CMSK's, SCIR's (Punchlist Reports))

Use Filter -> Correspondence "Type" to View only one specific item. Then click "Number" Column Header to sort in numerical order.

Project Schedule – Contractor Submitting Schedule

1. Open Correspondence Tool -> **"+ Create" -> "Project Schedule"**
2. Enter a **Number** Ex: "GC-01", "MC-02", etc.
3. **Status** should be Open.
4. Enter a **Subject**.
    a. Examples:
        i. "GC Project Schedule for Summer 2023 R1"
        ii. "GC Master Schedule R3"
        iii. "HVAC Equipment Delivery Schedule R1"
5. Set **Assignee** to CM Project Superintendent.
6. Set a **Due Date** to be 1 week from submission for CM review.
7. Leave **Private** check box unchecked.
8. Add "All Contractors" and "AE+CM" to **Distribution Group** for notifications.
9. Leave Origin Correspondence/RFI blank.
10. Attach the Two Week Look Ahead **PDF** in the **Attachment Box**.
11. Enter your company name in "**Contractor**".
12. Click "**Create and Issue**"
13. CM Superintendent to review, post a comment, and change status to "Closed" if acceptable.

Two Week Look Ahead – Contractor Submitting Two Week Look Ahead

1. Open Correspondence Tool -> **"+ Create" -> "Two Week Look Ahead."**
2. Enter a **Number** Ex: "GC-01", "MC-02", etc.
3. **Status** should be Open.
4. Enter a **Subject**.
    a. Examples:
        i. "GC – 6/19/2023-6/30/2023"
5. Set **Assignee** to CM Project Superintendent.
6. Set a **Due Date** to be 1 week from submission for CM review.
7. Leave **Private** check box unchecked.
8. Add "All Contractors" and "AE+CM" to **Distribution Group** for notifications.
9. Leave Origin Correspondence/RFI blank.
10. Attach the Two Week Look Ahead **PDF** in the **Attachment Box**.
11. Enter your company name in "**Contractor**".
12. Click "**Create and Issue**"
13. CM Superintendent to review, post a comment, and change status to "Closed" if acceptable.

Architect Sketch – Architect issuing Sketch (ASK)

1. Open Correspondence Tool -> "+ Create" -> "**Architect Sketch**"
2. Enter a **Number** Ex: "GC-01", "MC-02", etc.
3. **Status** should be Open.
4. Enter the Title as the **Subject**.
5. Leave **Private** check box unchecked.
6. Set **Assignee** to the Contractor Associated.
7. Set a **Due Date** to be 5 days from issue date for Contractor response. (or Project Specific Duration)
8. Add associated Contractor and "AE+CM" to **Distribution Member** for notifications.
9. Select applicable **Origin Correspondence/RFI**. If not applicable leave blank.
10. Enter a description in the **Description** Field.
11. Attach the "Sketch" PDF in the **Attachments** Box.
12. Enter the Contractor's company name in "**Contractor**".
13. Select the **Cost Proposal to be Submitted** selection from the drop down.
    a. Options: "No Cost Change Expected" or "Cost Proposal Requested"
14. Click "**Create and Issue**"
15. Contractor to review, **post a comment** confirming acknowledgement.
16. TPG Superintendent to **Close** once responded to by Contractor and associated Proposal is Submitted.

ASI – Architect issuing Architectural Supplemental Instruction (ASI)

1. Open Correspondence Tool -> "+ Create" -> "**Architectural Supplemental Instruction**"
2. Enter a **Number** Ex: "GC-01", "MC-02", etc.
3. **Status** should be Open.
4. Enter the Title as the **Subject**.
5. Leave **Private** check box unchecked.
6. Set **Assignee** to the Contractor Associated.
7. Set a **Due Date** to be 5 days from issue date for Contractor response. (or Project Specific Duration)
8. Add associated Contractor and "AE+CM" to **Distribution Member** for notifications.
9. Select applicable **Origin Correspondence/RFI**. If not applicable leave blank.
10. Enter a description in the **Description** Field.
11. Attach the "Sketch" PDF in the **Attachments** Box.
12. Enter the Contractor's company name in "**Contractor**".
13. Click "**Create and Issue**"
14. Contractor to review, **post a comment** confirming acknowledgement.
15. TPG Superintendent to **Close** once responded to by Contractor.

CMSK – CM issuing Construction Manager Sketch (CMSK)

1. Open Correspondence Tool -> "+ Create" -> "**Construction Manager Sketch**"
2. Enter a **Number** Ex: "GC-01", "MC-02", etc.
3. **Status** should be Open.
4. Enter the Title as the **Subject**.
5. Leave **Private** check box unchecked.
6. Set **Assignee** to the Contractor Associated.
7. Set a **Due Date** to be 5 days from issue date for Contractor response. (or Project Specific Duration)
8. Add associated Contractor and "AE+CM" to **Distribution Member** for notifications.
9. Select applicable **Origin Correspondence/RFI**. If not applicable leave blank.
10. Enter a description in the **Description** Field.
11. Attach the "Sketch" PDF in the **Attachments** Box.
12. Enter the Contractor's company name in "**Contractor**".
13. Select the **Cost Proposal to be Submitted** selection from the drop down.
    a. Options: "No Cost Change Expected" or "Cost Proposal Requested"
14. Click "**Create and Issue**"
15. Contractor to review, **post a comment** confirming acknowledgement.
16. TPG Superintendent to **Close** once responded to by Contractor and associated Proposal is Submitted.

SCIR – Architect or CM Issuing Substantial Completion Inspection Report or Punchlist Report (SCIR)

For issuing **Compiled** Substantial Completion Inspection and Punchlist Reports with Multiple Punchlist Items on one Report.
See Punchlist Tool for instructions on live Procore Punchlist Tool for individual Punchlist Items.

1. Open Correspondence Tool -> "+ Create" -> "**Substantial Completion Inspection Report.**"
2. Enter a **Number** Ex: "GC-01", "MC-02", etc. (Assigned to Specific Contractor)
3. **Status** should be Open.
4. Enter the Title as the **Subject**. Indicate Phase, Area, and Inspection Date.
5. Leave **Private** check box unchecked.
6. Set **Assignee** to the Contractor Associated.
7. Set a **Due Date** to be Project Final Completion Date. (or Project Specific Duration)
8. Add associated Contractor and "AE+CM" to **Distribution Member** for notifications.
9. Select applicable **Origin Correspondence/RFI**. If not applicable leave blank.
10. Enter a description in the **Description** Field.
11. Attach the "SCIR Report or Punchlist Report" PDF in the **Attachments** Box.
    a. If Procore Punchlist Tool is being used, attached the PDF Export of the Punchlist Report from the Punchlist/Reports Tool.
12. Enter the Contractor's company name in "**Contractor**".
13. Select appropriate **Inspection Area Includes**: "Entire Project" or "Portion".
14. Indicate if **Work Is Substantially Complete.**
15. Select the **Onsite Inspection Date**.
16. Indicate any **Areas Previously Inspected**.
17. Indicate **Areas Inspected in This Report**.
18. Click "**Create and Issue**"
19. Contractor to review, **post a comment** to submit a response/request reinspection.
20. TPG Superintendent to **Close** once all items in the report are addressed.

PROCORE OBSERVATION TOOL

AE/CM Instructions:

Create an Observation as an Architect/CM.

- Review Procore instructions:
  - https://support.procore.com/products/online/user-guide/project-level/observations/tutorials/create-an-observation
  - https://support.procore.com/procore-mobile-ios/user-guide/observations-ios/tutorials/create-an-observation-ios
- Observations can be created on a **Tablet** which is the recommended method of collecting photos and description finalized on PC. Or Created and Issued on Tablet, or entirely on PC.
  - Observations can be created by the CM or AE and Issued directly to the Contractor.
  - Or CM Issued to the AE (**private**) for AE review. Then reissued as a new item from the AE/CM to Contractor.

1. Open Observation Tool -> **"+ Create**" (On Tablet, select Manual Input -> Without Template)
   a. Quick Capture is another option which takes a photo/video with text to speech.
2. Select Observation **Type**: Safety vs Quality.
3. Leave **Status** as "Initiated".
4. Enter a **Title** for the observation. Include a Trade Prefix if Applicable.
   a. Ex: "GC-01", "MC-02", etc. Report Type Prefixes can be used as well. Ex: "CDR-GC-01"-Construction Deficiency Report, "EOR-MC-02"-Engineer's Observation Report, etc.
5. Select **Priority**.
6. Leave Observation **#** as auto filled, in default.
   a. Numbering to remain in sequence. Ex: 1, 2, 3, 4, 5 ,6. The # cannot be edited when Submitting on Mobile.
   b. See Title and Observation Number (For Assignee) fields for more information.
7. Select applicable **Location**.
8. Select **Assignee** responsible for responding to the observation item.
   a. Note 1: Only one user can be an assignee at a time. Primary Points of Contact are listed in the Home Tool.
   b. Note 2: All other users on the distribution list will still be notified.
9. Add in the Associated Contractors, and CM+AE Distribution Groups to the **Distribution**.
10. **Due Date** to be set as 5 Working Days by default. To be updated when the items BIC changes.
11. Select **Private** checkbox if item is to be restricted to the Contractor's in the Distribution Group.
12. For Safety Hazard Observations Only: Select **Contributing Condition**, **Contributing Behavior**, **Hazard** options from drop down as applicable. Contact TPG Admin if an item is needed that isn't in the lists.
13. Provide detailed **Description** containing information regarding the observations. Use numbered bullet point lists as needed for cross reference.
14. Provide **Attachments** as needed, separate PDFs of Reports created outside of Procore can be added here.
    a. On Mobile, this is where photos can be taken and imported.
15. Enter the **Observation Number (For Assignee)** which should match the number indicated in the title.
    a. Ex: "GC-01", "MC-02", etc.
16. List the associated entity in the **Company** Field for whom the observation is assigned to.
17. Press "Create"
18. Then from the Observations Main Page (where all observations are shown), press **"Send".**
    a. (Yellow Banner on PC) or (Send button next to orange "+" on Tablet)
    b. Observations will not be sent to the assignee until this action happens.

Contractor/AE Instructions:

Responding to an Observation as a Contractor/Architect

1. Review Procore instructions:
    a. https://support.procore.com/products/online/user-guide/project-level/observations/tutorials/respond-to-an-observation
    b. https://support.procore.com/procore-mobile-ios/user-guide/observations-ios/tutorials/add-a-comment-to-an-observation-ios
    c. https://support.procore.com/procore-mobile-ios/user-guide/observations-ios/tutorials/respond-to-an-observation-ios
2. Open Observation Tool -> Select View on the Observation Item to be responded to.
3. Post a response in the Comment field on how the item was addressed or what the response of the item is.
    a. Photos/Files can be added in the attachment field on PC and on Mobile.
    b. On PC Select Change Status in the Activity section to change the status and post a comment simultaneously. Mobile requires posting comment first, then change status.
4. If you are an Assignee, you will be able to change the status from “Initiated” to “Ready for Review”.
    a. Do not change the status to “Closed”.
    b. Non-Assignees in the Distribution (in the same company) can still post a response and photos.
    c. The Creator/Distribution will still be notified for all responses.

Reviewing an Observation response as an Architect/CM.

1. Review Procore instructions:
    a. https://support.procore.com/products/online/user-guide/project-level/observations/tutorials/respond-to-an-observation
    b. https://support.procore.com/procore-mobile-ios/user-guide/observations-ios/tutorials/add-a-comment-to-an-observation-ios
    c. https://support.procore.com/procore-mobile-ios/user-guide/observations-ios/tutorials/respond-to-an-observation-ios
2. Open Observation Tool -> Select View on the Observation Item to be responded to.
3. Post a response in the Comment field if the response was accepted or not accepted/requiring further backup.
    a. Photos/Files can be added in the attachment field on PC and on Mobile.
    b. On PC Select Change Status in the Activity section to change the status and post a comment simultaneously. Mobile requires posting comment first, then change status.
4. If you are the Creator, you will be able to change the status from “Ready for Review” to “Closed” or “Not Accepted”.
    a. Non-Assignees in the Distribution (in the same company) can still post a response and photos.
    b. The Creator/Distribution will still be notified for all responses. Then the TPG Super can set status to “Closed” or “Not Accepted”
5. If closed, then the item is complete. If Not Accepted, the due date is to be adjusted, and this will be returned to the Assignee’s Ball in Court.

PROCORE INSPECTIONS TOOL

CM/Contractor Instructions:

Create an Inspection as a CM/Contractor with a TPG templates.

- The following Inspection Templates have been created for use by The Palombo Group for Projects:
  - **[TPG] - PIPING PRESSURE TEST (WITNESS)** (by Contractor or witnessed by the CM)
  - **[TPG] - PRE-DRYWALL INSPECTION** (by the CM)
  - **[TPG] - ABOVE CEILING INSPECTION** (by the CM)
- Review Procore instructions:
  - https://support.procore.com/products/online/user-guide/project-level/inspections/tutorials/create-a-project-level-inspection
  - https://support.procore.com/products/online/user-guide/project-level/inspections/tutorials/perform-an-inspection
- Inspections can be created/performed on a **Tablet** which is the recommended method for collecting photos, signatures, making comments. Or Created and Issued entirely on PC.
  1. Open Inspections Tool -> **"+ Create**" -> "Inspection" -> Select Template.
     a. Orange "+" on Tablet. Do not use "Inspection Schedule". Leave **Status** as "Open".
  2. **Photos / Files / Attachments** can be added now or added later via "edit". On PC Documents/Drawings can be attached as well.
  3. **Inspection Date** to be date of Inspection. **Due Date** to be the latest the inspection is to be performed.
  4. **Assignees** is the Person(s) performing the Inspection.
     a. TPG Superintendent for Above Ceiling and Drywall Inspections. Contractor can perform their own Pressure Tests inspection if allowed on the Project.
  5. Select the correct **location** that covers the area (if Locations are set up). See "Area Information Field".
  6. Add the Associated Contractor's, CM, and Architect (if Applicable) to **Distribution** for notifications.
  7. Set **Private** to "no" or "unchecked".
  8. In **Description**, enter a general description and any other general information. Leave field blank if applicable.
  9. In **Area Information**, add in specification location/area information.
     a. Example: "Area A Bathrooms", "Café" "Rooms 101, 102, and 103"
  10. **Contractors associated with Work being Inspected** to list Contractors/ Points of Contact who performed the work that is being inspected.
  11. **Contractors with Open items** to be left blank until inspection is performed. Then edit later to add Points of Contact for Contractors with open items once inspection is performed with failed items.
  12. **Contractor Responses**, this field is used to store any contractor responses made outside of Procore.
      a. Example: Cut and paste an email response with timestamp and sender.
  13. **Terms and Conditions** is a read-only field to be printed on the report.
  14. Press "**Create**".

Perform an Inspection as a CM/Contractor with a TPG templates.

- The following Inspection Templates have been created for use by The Palombo Group for Projects:
    - **[TPG] - PIPING PRESSURE TEST (WITNESS)** (by Contractor or witnessed by the CM)
    - **[TPG] - PRE-DRYWALL INSPECTION** (by the CM)
    - **[TPG] - ABOVE CEILING INSPECTION** (by the CM)

1. With the inspection open (view mode) on Tablet or PC, review each item and select the Green "Check" or Red "X" for pass or fail of the inspection item.
    a. If an item failed the inspection, press the **"i"** to:
        i. **Add a comment** detailing the issue.
        ii. **Take a photo** to be associated with the item.
        iii. **Observation** Reports can be made if the item is a major item that requires further follow-up.
            1. See "Create Observation Item" Instructions.
    b. Take pictures of passing items either by pressing the item specific **"i"** and the select "photo" or for general overall photos, pressing "Edit" then selecting the Camera Tool.
    c. Add general comments of passing items either by pressing the item specific **"i"** and the select "comment" or for general overall comments, pressing "Edit" then edit the Description.
2. Add in any text information any of the "Add Text" information fields that require text to be entered.
3. Once all items are reviewed:
    a. **If there are any failed items,** then "Edit" the Inspection to add Contractors to the **Contractors with Open items** field for tracking and to the **Assignee** field.
    b. When a failed item has been addressed and reinspected, by using the **item specific "i" activity button:**
        i. Add comment is to be added (by the CM or Contractor) confirm how the item was addressed.
        ii. Provide a photo of the addressed item.
        iii. CM to then review and confirm acceptance, then change the item to passing if accepted.
    c. **If all items passed inspection**, then select "Add" under **Signatures** (in view mode) and add associated contractors and CM Superintendent to sign the inspection report. Then add these users to the assignees via "edit" then add to the **Assignee** field. (Check Project Requirements for signatures on TPG Reports.
        i. If an assignee was already assigned due to having a previously failed item, then they need to be removed from **Assignee**, save the inspection, reselect "edit", then re-add that user in order for them to get an email notification.
4. Once all items are in a passing state, and any required signatures a received, then the **Status** is to be changed to "closed", this will send out an email notification to all on the Distribution List.
5. The Inspection can then be exported via the "Export" button for record.

PROCORE INCIDENTS TOOL

CM Instructions:

Create an Incident as a CM/Contractor with a TPG templates.

- The following Incident Report Templates are available for use for documenting Incidents that have occurred:
  - **Major Injury/Illness**
  - **Property Damage**
  - **Environmental**
  - **Near Miss**
- Review Procore instructions:
  - https://support.procore.com/products/online/user-guide/project-level/incidents/tutorials/create-an-incident
- Incidents can be created/performed on a **Tablet** which is the recommended method for collecting photos, signatures, making comments. Or Created and Issued entirely on PC.

1. Open Incidents Tool -> **"+ Create**" -> "Incident" -> Select Template. Orange "+" on Tablet.
2. Enter a **Title** that Describes the Incident.
3. In the **Distribution**, add any users that were associated with the Incident to the distribution so they can view the report and be notified when issued/closed.
4. Add the **Location** of the Incident. (Locations must be set up prior.)
5. **Event Date** and **Event Time** to be entered.
6. For the **Recordable** check box, leave unchecked.
7. Enter a detailed description of all aspects of the Incident in the **Description** field. Include detailed sequence of events, identified any precautions, protocols, or guidelines not followed.
8. Attach Photos, outside reports, and/or other documents to the **Attachments** field.
9. Enter **Hazard**, **Contributing Condition**, and **Contributing Behavior** from the pre-set drop down lists. If additional items need to be added, contact TPG Admin.
10. Press "**Create**" to create an Open Incident. Then further detailed information can be added before the report is closed.
11. Under **Incident Records**, add a record for the Incident based on the available Incident Types: **Major Injury/Illness, Property Damage, Environmental, Near Miss.**
    a. Fill out all fields detailing the record, then press "**Create"**.
12. Under **Witness Statements,** if applicable add a Witness Statement Entry.
    a. If a witness is not a user in Procore, then a new name can be added under "Create Person".
    b. Fill out all applicable fields, then press "**Create**".
13. Under **Actions**, add an action as either "Preventative" or "Corrective". Fill out info, then "**Create**".
14. Once the report is complete, "Edit" the Incident to change the **Status** from **"Open"** to **"Closed".**

DAILY LOG TOOL AND PHOTOS TOOL

Daily Log Tool on Tablet, Mobile, or PC

1. In the **Weather** section, typical data is automatic for temperature, weather conditions, wind.
    a. If there is an abnormal extreme weather event, an entry can be added.
2. **Manpower**:
    a. Create entries for each contractor onsite.
    b. If a Prime Contractor has multiple trades or subcontractors, then separate entries need to be created for each trade (designated by the "Trade – Subcontractor" field).
    c. "Trade – Subcontractor" should be entered as "Trade Name" – "Subcontractor Company name" if applicable. If manpower is self-performed by Prime Contractor, then only enter the trade name.
    d. If locations are set up, utilize to identify the general area that the workers in. If workers are working in multiple rooms or areas and not in one specific, use the broader tier.
    e. Enter a detailed description in the Comments field of what work each trade performed.
3. **Photos** (Tablet or Mobile Only):
    a. Photos should be taken directly on the Procore App Daily Log Tool, using "+" -> Take a Photo.
        i. (Not Camera or Photo's Tool).
    b. The album selection at the top should be set to "Photos from Daily Log", not "Unclassified" or any other album.
    c. Enable the Time Stamps printed on the photos with the Time Stamp Button at the top.
    d. Once photos are taken, the icon in the bottom left can be tapped to view the taken photos.
    e. Photos can be marked up with pen, clouds, arrows, and text boxes. Descriptions can be entered in the photo in the markup section.
    f. "Specific Issues" Photos to be taken using applicable Observation, Punchlist, Inspections Tools.
    g. Procore Photos Tool can be used to view and manage all photos taken for a Project.
4. **Inspections** (Not to be confused with Inspections Tool):
    a. Inspections including 3rd Party Special Inspections can be entered in this section.
    b. All Entries to be filled out: Inspector (Name), Start/End Time, Type (Steel, Structural, Concrete, Masonry, Air Monitoring, TPG Pre-Ceiling/Drywall etc.)
    c. To be used when reviewing Special Inspections Invoices.
5. **Dumpsters** (Only to be enable if TPG is tracking dumpsters for invoicing (set in Daily Log configuration)
6. **Notes**: Any other unspecified general notes to be entered here.
7. **Complete Day**: After a Daily Log is finalized at the end of the day, press the "Complete Day" Button to finalize the entries. On the PC version, this is viewed in Calendar view or at the bottom of the Log.
8. **Daily Log / Manpower Report**: In the **Reports Tool**, the "Daily Log / Manpower (Project Level)" Report can be used to view all daily log entries throughout a Project. Filters are available to filter by company.

DRAWINGS TOOL (Posting Drawings with RFI's as CM)

Personal <u>unpublished</u> mark ups can be placed for your personal use in any preferred formatting. Published mark ups by TPG will be posted for all users.

Posting Post-Bid Clarifications: RFI's, Sketches, Documents (Change Orders), Correspondence (ASI's/Sketches):

A Log/Checklist should be maintained to check off which items have been posted and which Drawing Numbers they were posted to.

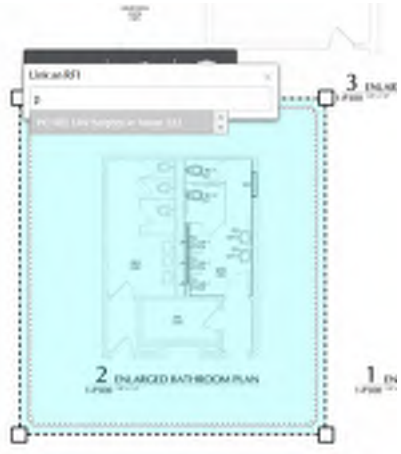
9. Open Drawings Tool.
10. Select the Mark Up Button.
11. Select Cloud Tool.
12. Draw a cloud around the item that relates to the item being posted.
13. Select the attachment button.
14. Select the item type (RFI, Submittal, Document, Correspondence (Contains: Sketches, ASI's, CIC's, Bulletins), etc.)
    a. Note that "Sketch" is a separate undeveloped tool and not related to the sketches issued under Correspondence Tools.
15. Type in the name of the item (ProCore will autofill).
16. Press the "**Publish"** which will make the mark up live to all.
    a. Unpublished mark ups will stay personal to you for your uses.

Color code for mark ups:

- Red – Addendum (Prior to Procore)
- Green – Approved PCO's (Change Orders / Allowances Executed)
- Yellow – Clarifications (ASK's/ASI's/Sketches/Bulletin's/CIC's) (No cost items)
- Blue – RFI's

Other available tools in Drawings Tool:

- Measure (Calibrate first):
  - Distance
  - Area
- Link other Drawings for short cuts.
- Pin:
  - Photos
  - Punchlist
  - Observation Reports



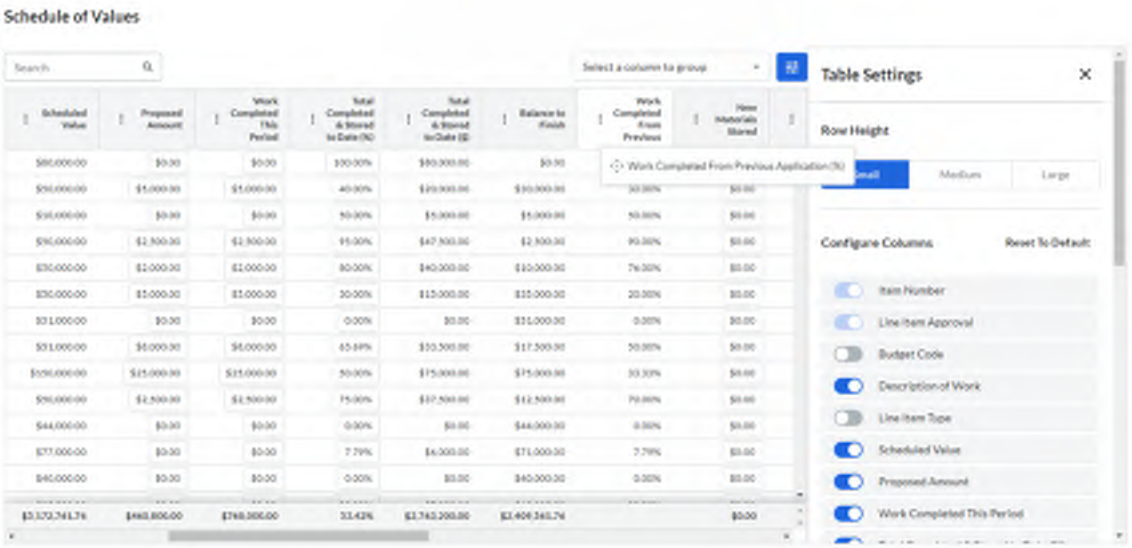
PROCORE INVOICING/COMMITMENT TOOL FOR INVOICES/APPLICATION FOR PAYMENT

Methods to view an invoice (All Users):

1. Responding to email notification: (Invite to Bill or Action Required in Workflow Email Notification)
2. Commitment Tool -> Subcontractor's Tab -> Select Contract Number -> Invoices ->
    a. "Create" -> "Invoice" (only if the Invite to Bill email has been sent)
        i. This method will require the Contractor to enter in the Proposed amount twice in "Proposed Amount" and "Work Completed This Period". Then press "Start Workflow" once complete.
    b. Select the previously created Invoice from the list.
3. If the Invoice has already been created: Home Tool -> My Open Items -> Select the Invoice

Optimizing the View of the SOV for each invoice (Once invoice has already been created) (All users):

1. Procore by default displays the columns in SOV of the invoice with extra information that isn't needed and can be adjusted to view all the information needed at a glance. **This adjustment only needs to be completed for the first Invoice (each contractor),** then follow-up invoices will have the layout saved for the rest of the project.
2. With the invoice open and the Schedule of Values in view, select the **Table Settings** Button.
3. **Disable**: "Budget Code" and "Line Item Type".
4. **Pin** "Total Completed & Stored to Date (%)" **to the left** using the 3 dots button in the column header.
5. Expand the column widths as needed to see all the text in the boxes (descriptions, long column header names)
6. Set row height to "small" (user preference)
7. For CM Pencil Review, Hide the Workflow prior to reviewing/editing the SOV. Then View Workflow and Respond after.
8. To Group by building with **Building Subtotals**, choose "Select column to group", then select "Sub Job".



Creating Billing Period and Inviting the Contractor to Bill (CM ADMIN STEP)

1. Open **Procore Invoicing Tool**.
2. Select "**Create Billing Period"**.
    a. A Billing period should be created once all previous Invoices have been Approved in Procore by the Owner or 5 Days before the Invoice Due Date to allow contractors time to assemble their invoice.
    b. If the previous billing period is not complete for a specific contractor and the next invoice is created, then the previous invoice cannot have any dollar amount changes, and attachments/comments will only be able to be edited by the CM.
3. Select **Manual** Mode.
4. **Default Billing Period** is the first day of the month to the last day of the month.
5. **Procore Due Date** should be 3 days after the actual project due date for the invoice.
    a. This is to account for weekends and technical issues if the contractor is having an issue submitting.
    b. If a contractor needs to submit after this date due to a technical issue, this due date can be changed later to allow submission of the Invoice.
6. Press the "**Create**" Button. This will set the previous billing period to close and open the new billing period.
7. Select the Subcontractor Tab to view all the invoices. Each Contractor should now be listed for the current billing period.
    a. By default, the current billing period is filtered. Press the "x" next to the billing period filter to remove the filter and see all Invoices for all Contractors.
8. Select the **check box** next to each contractor, then press "**Send Invites**". This will send an email notification to the Invoice Contacts of the Contractors.
9. Once the Contractor Responds to the Invite to Bill, the Invoice Workflow will start.

Procore Invoice / Application for Payment Review Process

CONTRACTOR SUBMISSION (BY CONTRACTOR)

1. https://support.procore.com/products/online/user-guide/project-level/commitments/tutorials/accept-or-decline-an-invite-to-bill-as-an-invoice-contact
2. Respond to "Invite to Bill" email notification sent to the Contractor's "Invoice Contacts". Selecting "Yes" in the invite which will open the invoice in Procore.
3. Once the Invoice is open in Procore, follow the procedure below to enter in the information. Press the "Edit" Button to change the information in the Invoice.
    a. https://support.procore.com/products/online/user-guide/project-level/invoicing/tutorials/create-a-new-invoice-as-an-invoice-contact
4. Enter an **Invoice Number,** this is the "Trade Prefix-Invoice Sequence Number."
    a. Example: GC-02, MC-32, WC4-08
5. **Billing Date** is the date of submission.
6. Scroll down to the **Schedule of Values** section.
    a. See Instructions for "Optimizing the View of the SOV for each invoice (Once invoice has already been created) (All users):"
7. Edit the **Percentages** or **Dollar Amounts** on each line item that is being requested to bill against.
    a. This should happen as one activity. **If the Contractor saves, exits, and re opens later through the commitment tool, or creates the invoice in the Commitments Tool directly then the Dollars in "Proposed Amount" will not be auto filled, and the contractor will have to manually enter in the dollars in both Proposed Amount and work/material this period.** Recommend entering once through "Invite to Bill" Email invite.
8. **Change Orders** and **Allowances** must be fully executed and processed in Procore prior to the creation of the invoice in order to be billed against. Once processed, they will show in the SOV.
9. Do not adjust any **Retainage** columns, this must remain the default. If a retainage release is being requested, it must be formally requested outside of Procore prior. TPG will then provide direction on the Retainage Release Procedure after preliminary approval.
10. Scroll Down to the **Additional Information** section.
    a. Add any General Comments by the Contractor in the "Contractor General Comments" text box to provide further explanation on any of the billing items.
        i. For any work that is not currently complete but **anticipated to be complete** by the end of the billing period, list these items in this field.
    b. List any subcontractors who were onsite for the current billing period in the "**Prime Contractor's Subcontractors Onsite"** text field. This is for Certified Payroll and Partial Lien Waiver review purposes.
    c. The additional Attachment upload slots will be left blank until the invoice has been reviewed and the pay app is returned to the Contractor in the later workflow steps. The Coversheet does not need to be signed at this point.
    d. If there is **Stored Material** being billed (new or present) (Column F), the backup must be included with the Pencil to include the backup including: List of Material, Invoices, Photos, and Special Insurance. This is to be uploaded to the **"Invoice Back Up Attachments"** Upload Slot. This file will be replaced by the Final **PDF Back Up Attachment** when the Contractor Submits the Final.
11. Once the Invoice is complete, press the "Send" or "Save" Button.
12. Then to submit to the CM, view the workflow column on the right side of the screen and then press "respond".
    a. Choose the default response option, enter any general comments in the response field, leave the attachments box blank.
    b. Press "submit" to send to the "CM PENCIL REVIEW" Step.

CM PENCIL REVIEW (BY CM SUPERINTENDENT)

1. Open the invoice and review the General Information section, confirm that the Contractor entered the correct **Invoice #.** For user preference, the **invoice can be printed** by pressing the "Export" -> "PDF" button.
2. Click Edit on the "Schedule of Values" section of the Invoice.
    a. Review each line item that has dollars billed in the "Proposed Amount" Column.
        i. If the proposed amount or percentage is acceptable, click the green "check" to approve.
        ii. If the proposed amount or percentage is not acceptable, click the red "X" and then add a comment that indicates the reason.
            1. Then include the original percentage **and** the revised percentage in the reason box along with the reason. Example: "Change from 80% to 50%. Only half the work is complete."
            2. Then change the percentage in the "Total Complete & Stored to Date" Column to the amount noted in the comment.
            3. Do not change the amount in the "Proposed Amount" Column.
        iii. Do not click a "Check" or an "X" for line items that do not have any dollars billed in the proposed amount column.
        iv. Check that all the Retainage Dollars
            1. Shortcut: Click the column header for Retainage to change sort which will cycle ascending/descending and if any items are above/below the default percentage they will show at the top.
    b. Click the "Save" button to save all changes.
3. Click "Edit" on the "Additional Information" Section of the invoice.
    a. Check that the Contractor listed the Subs onsite in the **"Prime Contractor's Subcontractors Onsite"** section. If not, correct/add the subs who were onsite.
    b. Add in any general comments in the **"Construction Manager General Comments"** section.
    c. Press the "Save" button.
4. In the workflow Column press the "Respond" button.
    a. Select: "**CM Reviewed - Forward for AE Pencil Review**" as the response option.
        i. If a Pay App is completely wrong and pay app is to not be reviewed, select "Revise and Resubmit" and provide a reason why.
        ii. Do not select the "CM Bypass Approval", this is an Admin only option to bypass the entire workflow if the Pay App was processed outside of Procore.
    b. Press the Respond button to send the Invoice to the next step. Dollar amounts will now be locked as the Invoice is now in the "Under Review" Status.

AE PENCIL REVIEW (BY ARCHITECT)

1. Open the Invoice and view either by:
    a. Pressing the "Export" -> "PDF" button to open a printable pdf. The Comments will be on the last page.
    b. View the invoice in Procore.
2. Return the Invoice by pressing the "Respond" button and selecting "AE Reviewed - Return to CM to address comments and resubmit Final" response option.
    a. Provide any text comments in the response text box. If the pdf was marked up, place the pdf into the "Attachments" upload slot.
3. Click "Respond"

CM COMPILED COMMENTS (BY TPG ADMIN)

1. Open the invoice and review any additional comments made by the Architect in either their workflow response text box or any attachments in the workflow section.
2. Check to make sure TPG Superintendent properly filled out all comments during the "CM PENCIL REVIEW" step.
3. If the Architect has any line-item percentage changes:
    a. Select Respond -> "Adjust SOV Billing Line Items" Response option -> Respond to change the Invoice back to draft status to allow Schedule of Value changes. Once Changes are made, respond in workflow with "Reviewed and Accepted" response option.
    b. Follow procedure in 2. A. ii. Under the "CM PENCIL REVIEW (BY CM SUPERINTENDENT)" section of the instructions to edit Invoice line items.
4. Cut and paste any comments by the Architect in the "**Architect General Comments**" text box in the "Additional Information" section of the invoice.
5. Return the Invoice by pressing the "Respond" button and selecting "Return and Resubmit Signed Pay App w/ comments addressed" response option.
6. Create a folder in the TPG OneDrive "(2-1) APPLICATION FOR PAYMENT" folder using the **monthly** template within each contractor folder. Rename the template to have the Pay App # and the Month / Year. Example: "PAY APP 32 OCT 2023"
7. Save a copy of the PDF export to the TPG OneDrive "(2-1) APPLICATION FOR PAYMENT" Folder under "(2) PENCIL".

CONTRACTOR REVISED INVOICE (BY CONTRACTOR)

1. Open the invoice and then press the “Export” -> “PDF” to view the adjusted Invoice. All comments / line item changes (with explanations) will be shown on the last sheet of the PDF.
2. See Instructions posted on Invoice / in Procore:
    a. Percentages have already been adjusted per our comments to match the allowed percentages. No changes to the SOV / Line items billed to be made. If there are any questions on the line item changes, note them in the comments of the workflow text box when responding to the Invoice or contact TPG Project Superintendent.
    b. **All documents must be uploaded in the correct orientation/rotation. If scanned in the wrong orientation, a PDF editor must be used to correct prior to uploading.**
    c. Export PDF of coversheet, Print, Sign in blue ink & notarize, scan in color in high quality, upload **signed cover sheet <u>only</u>** into workflow attachments field. (label filename with Trade).
    d. Provide **one PDF Back Up Attachment** for all items below and upload as the second item in the workflow attachment slot. (Label File Name with Trade)
        i. Provide Contractor Partial Lien Waiver PDF.
        ii. Provide Subcontractor / Major Supplier Partial Lien Release PDF in attachment field.
            1. Provide list of subcontractors and periods as a coversheet if there are more than 3 subcontractors / suppliers.
            2. This list will be checked by cross-referencing certified payroll from each subcontractor listed in the previous billing period.
        iii. Provide Prime Contract Certified Payroll PDF in attachment field.
            1. If “no work” was performed for the billing period, a sheet must be provided stating there was no work performed during the billing period.
        iv. Provide Subcontract Certified Payroll PDF in attachment field.
            1. Provide list of subcontractors and periods as a coversheet if there are more than 3 subcontractors.
            2. See list above of subcontractors that are required to submit certified payroll.
            3. Once a subcontractor begins work onsite, they must submit certified payroll for every week until the end of the project, or documentation of dates that the subcontractor was not onsite.
        v. Provide any other requested back up.
            1. This includes all documentation for all stored material (Special Insurance, List of Material, etc.).
    e. Once the Invoice package attachments are added, press the respond button in the workflow column to send the Invoice to the CM for CM Signature.
    f. Send The Palombo Group an email if there are any questions on this process.

CM SIGNATURE (BY CM ADMIN OR CM EXECUTIVE)

1. Open the invoice and review any comments made by the contractor in the workflow section.
2. Review the backup attachment document uploaded by the Contractor for:
    a. Lien Waivers, Subcontractor Lien Waivers, Prime Contractor Certified Payroll, Subcontractor Certified Payroll, any stored material back up, and any other back up documentation required.
3. If the Invoice Back Up Package is acceptable, download the PDF to the computer and then reupload to the **"Invoice Back Up Attachments"** upload slot. Procore cannot drag and drop attachments from the workflow to the upload slot. These items can be stored in the "(3) DRAFT FINAL BACK UP DOCS" folder in OneDrive.
4. Verify that the Coversheet uploaded by the Contractor is signed (blue ink), notarized, and matches all dollar amounts shown in the "Summary Preview" section of the Procore Invoice.
5. Download this coversheet and print for CM Executive Signature. Then upload into **"Signed Coversheet"** upload slot.
6. Check the checkbox for "**Turn Off Additional Information Page"** to remove the "Additional Information" page on the Final Invoice export.
7. If any of these items are incorrect, select "Revise and Resubmit" response option and return to the contractor with reason why listed in the workflow text box.
8. If a dollar amount needs to be changed at this stage after further discussion with CM, Contractor, and Architect; select "Adjust SOV Billing Line Items" response option.
9. If ready for Architect's signature, select "Reviewed and Accepted" response option.

AE SIGNATURE (BY ARCHITECT)

1. Open the invoice and press the "Export" -> "PDF" button to open a printable pdf.
2. Review the Invoice.
3. Press "Respond" in the workflow column.
4. If acceptable: Print, Sign, upload the **Coversheet only** and upload into the **workflow attachment slot**.
    a. Select "Reviewed and Accepted" to send to CM to be then forwarded to the Owner.
5. If not acceptable, select "Revise and Resubmit" response option to return to CM and state reason why.

CM COMPILED SIGNATURES (BY CM ADMIN)

1. Open the Invoice and confirm that the Architect signed the coversheet and uploaded into the workflow.
2. Download the Signed coversheet, and then re upload into the "**Signed Coversheet"** upload slot in the Additional Information section of the Invoice.
    a. Procore cannot drag and drop attachments directly from the workflow to the upload slot.
3. **If acceptable, click "Respond" then select "Reviewed and Accepted" response option to send to the Owner.** Save copy of PDF export in TPG OneDrive "(2-1) APPLICATION FOR PAYMENT" Folder under "(1) EXECUTED".
4. If not acceptable, select "Revise and Resubmit" response option to return to Architect and state reason why.

OWNER REVIEW (BY OWNER)

1. Open the Invoice in Procore via email notification or Commitments Tool -> Contract Number -> Invoicing.
2. Select "Export" -> "PDF" to export the entire Invoice / Application for Payment Package.
3. If acceptable, press the Respond button in the workflow column on the right.
    a. Select "Reviewed and Accepted" response option, then press "respond" to confirm receipt and notify all parties that the Invoice has been accepted.
4. If not acceptable, select "Revise and Resubmit" response option to return to CM and state reason why.

CHANGE ORDERS (POTENTIAL CHANGE ORDERS, CHANGE ORDERS, ALLOWANCES)

POTENTIAL CHANGE ORDERS (COMMITMENT TOOL PCO's) (2 TIER CHANGE ORDERS)

Contractor PCO Submission (1st Submission) – (CONTRACTOR STEP)

1. Open **Commitments Tool.**
2. Select the associated Contractor Contract Number -> **"+ Create**" -> "**Create Potential CO**".
3. Enter the PCO **Number** (with trade prefix) and **Revision** Ex: "GC-01", "MC-02", etc. Default Revision is "0".
4. Enter a PCO **Title** that briefly describes the PCO, (45 Character Limit).
    a. Do not reenter the PCO number in the Title.
    b. Include relevant "Proposal Request" or "RFI", Number.
5. Select applicable **Change Reason** from drop down.
6. Leave **RFQ** blank.
7. Leave **Private** checkbox set to private/checked.
8. Enter a detailed **Description** of the Potential Change Order **including justification** for contract cost change and/or contract time change. This can be cut and pasted from Contractor's PCO PDF if already included.
9. Leave **Request Received From** blank.
10. Select applicable **Location**. (Only if Locations are set up, otherwise leave blank).
11. If there is a **Schedule Impact** to the Final Substantially Completion Date only, then enter in the number of days delayed. If none, enter "0" Days.
12. If there is a Proposal Request or other issued price request document/RFI, enter the number in **Reference.**
13. Leave **Field Change** and **Paid in Full** check boxes unchecked.
14. Upload the Contractor PCO PDF to the **Attachments** field, to include the following **in one combined PDF**:
    a. Cost Breakdown to include itemize Labor / Material / Equipment items. Applies to Subcontractors as well.
    b. Include Line items that Show: Item, QTY * Rate * = Extended Cost
    c. Add these items to a subtotal that includes no mark up. Requirement applies to Subcontractors as well.
    d. Then Apply Project Standard mark up and list Grand Total.
    e. Include PDF copy of any associated Documents, Proposal Requests, RFI's, Drawings, emails, etc. within the Contractor PCO PDF Attachment. (One combined PDF).
15. Enter the initially submitted Revision #0 Cost in **Initially Submitted Cost (with Mark Up): ($)** (Pre-Negotiated Cost)
16. Enter the current Cost without OH&P/Mark Up in **Current Cost (no Mark Up): ($)** (This is the cost for Allowance)
17. Enter the total current Cost (update if Revision) in **Current Cost (with Mark Up): ($)** (This is the cost for C.O.)
18. Leave **Owner Recommendation, Architect Comments, Constriction Manager Comments, Contractor Revision Comments (Dated): Contractor Revision Comments (Dated)** as Blank.
19. Press **Save / Save as Draft** to create the PCO. (Not Submitted Yet).
20. To submit the created PCO to the CM, press **"Start Workflow",** then "**Show Workflow**" (Takes a few seconds to update).
21. Press **Respond** to open the review workflow.
22. Select "Contractor PCO Submission" Response.
23. Attach a copy of PCO PDF to the **Workflow Attachment**s slot to retain a record copy of original PCO if the main attachment gets updated. Workflow Attachments do not get deleted.
24. Comments in the **Workflow Comments/Reason for Response** box can be entered for Revisions describing changes.
25. Press **Submit** to send the PCO to CM PCO Review.

Contractor PCO Revision (Revision Submission) or View Status of PCO – (BY CONTRACTOR)

At no point is the PCO to be edited by the Contractor using the Edit button to make changes after the PCO is submitted. Revisions are to be submitted to the original PCO in the Workflow, no new PCO to be created.

1. Open PCO by either:
    a. **Home Tool** -> "My Open Items" list -> Select PCO Number.
    b. **Commitments Tool**-> Select the associated Contractor Contract Number
        i. Change Orders Tab -> Scroll Down to Potential Change Orders -> Select PCO Number.
    c. **Reports Tool** -> Potential Change Order Log (Commitment PCO's) (Enhanced) -> Select PCO Number.
2. Press **Respond** to open the review workflow.
3. Select "Contractor PCO Submission" Response.
4. Attach a copy of Updated PCO PDF to the **Workflow Attachment**s slot to retain a record copy of original PCO if the main attachment gets updated. Workflow Attachments do not get deleted.
5. Comments in the **Workflow Comments/Reason for Response** box can be entered for Revisions describing changes.
6. Press **Submit** to send the PCO to CM PCO Review.

CM PCO Review or View Status of PCO – (By CM Superintendent/PM) (Send to Contractor R&R, AE, or Owner)

1. Open PCO by either:
    a. **Home Tool** -> "My Open Items" list -> Select PCO Number.
    b. **Commitments Tool**-> Select the associated Contractor Contract Number.
        i. Change Orders Tab -> Scroll Down to Potential Change Orders -> Select PCO Number.
    c. **Reports Tool** -> Potential Change Order Log (Commitment PCO's) (Enhanced) -> Select PCO #.
2. Check that the general information fields are filled out properly by the Contractor for the PCO (per instructions).
3. Review the Workflow for changes: From Contractor, Architect, or Owner: Comments and Attachments.
    a. Copy and paste any comments (List **itemized**, **dated** & **initialed)** from the previous step into the appropriate: Contractor, Architect, or Owner; **Comment Fields** into the PCO when in edit mode.
    b. Download and reupload any previous attachments from the Workflow into the "**Attachments**" field.
4. To Export PDF, with the PCO item updated and open, press the Export Button to download the complete PDF.
5. To add CM comments, with the PCO open, press the edit button, then:
    a. List itemized, dated & initialed comments in "**Construction Manager Comments (Dated):"** text box.
    b. Attach the updated marked up PCO attachment to the **Attachments Field**. Leave the previous attachments for record if needed or remove if not needed. Attachments will be shown in the export.
    c. If comments are complex or in dispute: detailed comments can be sent via email if necessary; and then when resolved, the Contractor can submit the latest revision to Procore.
6. Press **Respond** to open the review workflow.
7. Select either "CM Reviewed - Forward for AE PCO Review", "Revise and Resubmit", "Rejected - No Revision to be submitted", or "CM Reviewed and Accepted - Forward for Owner Approval" responses respectively.
8. Indicate whether CM Comments are in the text box, marked up pdf attachment, or sent separately via email in the **Workflow Comments/Reason for Response** box.
9. Press **Submit** to send the PCO to the next step per the response choices. Remove Assignee from associated PR.
10. If PCO is accepted and ready to be processed, use the "**CM Reviewed and Accepted – Forward for Admin Processing**" workflow response option.
    a. Back up PDF's (PR's, RFI's, Sketches, etc.) to be included in the attachments field.
    b. Cost fields to be updated. Note cost amount and if: Change Order or Allowance, in the comments.
    c. **"Explanation and Recommendation to Owner (By CM/AE):"** Field should be filled out.
11. If a PCO is to be on hold for an extended period, use "**Hold PCO Until Further Notice (No Notifications)**".

ARCHITECT PCO Review or View Status of PCO – (Return to CM with AE Comments, or Send to Owner)

1. Open PCO by either:
    a. **Home Tool** -> "My Open Items" list -> Select PCO Number.
    b. **Commitments Tool**-> Select the associated Contractor Contract Number.
        i. Change Orders Tab -> Scroll Down to Potential Change Orders -> Select PCO Number.
    c. **Reports Tool** -> Potential Change Order Log (Commitment PCO's) (Enhanced) -> Select PCO #.
2. To Review PCO and add Architect comments (**Architect STANDARD USER**):
    a. Export the PCO as PDF, with the PCO open, press the Export Button to download the complete PDF.
    b. Press **Show Workflow** -> **Respond** to open the review workflow.
    c. Select "Return to CM with AE Comments" **Response Option**.
    d. **List** itemized, dated & initialed comments in the "**Workflow Comments/Reason for Response"** text box.
    e. **Attach** the updated marked up PCO attachment to the **Workflow Attachments Field**.
    f. If the PCO is Accepted by the Architect, provide an **"Explanation and Recommendation to Owner (By AE):"** in the Workflow Comment box for:
        i. Record justification of why the Change Order/Allowance is needed. (To be used for the C.O.)
        ii. To be processed as a Change Order or Allowance.
        iii. Accepted Dollar Amount.
    g. Press **Submit** to send the PCO to the next step per the response choices.
3. OR: To Review PCO and add Architect comments (**Architect ADMIN USER**):
    a. With the PCO open, Press the edit button in the top right corner.
        i. (Do not change any fields except as shown below).
    b. **List** itemized, dated & initialed comments in the "**Architect Comments (Dated)"** text box.
    c. **Attach** the updated marked up PCO attachment by adding it to the **PCO Attachments Field**.
    d. If the PCO is Accepted by the Architect, enter in the **"Explanation and Recommendation to Owner (By AE):"** Field in the Workflow Comment box for:
        i. Record justification of why the Change Order/Allowance is needed. (To be used for the C.O.)
        ii. To be processed as a Change Order or Allowance.
        iii. Accepted Dollar Amount.
        iv. Accepted Schedule Impact/Extension of Time or indicate no Extension to the Final Substantial Completion Date.
    e. Press "**Save**", (not Save & Email).
    f. Press **Show Workflow** -> **Respond** to open the review workflow.
    g. Select one of the **Response Option** (depending on Project Requirements):
        i. "Return to CM with AE Comments" Standard Option in most cases.
        ii. "Architect Send to Owner (AE Admin Bypass Only)"
            1. If the Owner is required to approve PCO's and is 100% prepared with compiled comments properly added.
            2. Final PCO Should be checked via export button before sending to the Owner.
    h. Indicate whether Architect Comments are in the PCO text box, marked up pdf attachment, or sent separately via email in the **Workflow Comments/Reason for Response** box. If marked up PDF is used, include record copy of attachment in workflow attachments as well.
    i. Press **Submit** to send the PCO to the next step per the response choices.
4. Press **Submit** to send the PCO to the next step per the response choices.

OWNER PCO Review or View Status of PCO – (Return to CM) (Only used if Owner Review of PCO's is required)

1. Open PCO by either:
    a. **Home Tool** -> "My Open Items" list -> Select PCO Number.
    b. **Commitments Tool**-> Select the associated Contractor Contract Number.
        i. Change Orders Tab -> Scroll Down to Potential Change Orders -> Select PCO Number.
    c. **Reports Tool** -> Potential Change Order Log (Commitment PCO's) (Enhanced) -> Select PCO #.
2. To Review PCO as the Owner:
    a. Export the PCO as PDF, with the PCO open, press the Export Button to download the complete PDF.
    b. Press **Show Workflow** -> **Respond** to open the review workflow.
    c. Select **Response Option:** "Reviewed and Accepted" if accepted otherwise "Revise and Resubmit".
    d. If there are any comments, provide in the "**Workflow Comments/Reason for Response"** text box.
    e. Press **Submit** to return the PCO to CM for processing or corrections.

CM PCO ADMIN PROCESSING – (PREPARE FOR CHANGE ORDER OR ALLOWANCE AUTHORIZATION)

1. Open PCO by either:
    a. **Home Tool** -> "My Open Items" list -> Select PCO Number.
    b. **Commitments Tool**-> Select the associated Contractor Contract Number.
        i. Change Orders Tab -> Scroll Down to Potential Change Orders -> Select PCO Number.
    c. **Reports Tool** -> Potential Change Order Log (Commitment PCO's) (Enhanced) -> Select PCO #.
2. To Process the PCO:
    a. Export the PCO as PDF, with the PCO open, press the Export Button to download the complete PDF.
    b. Review the PCO to confirm:
        i. General Information is correct: PCO #, Revision#, Title, Description, Reference (with RFI/PR #'s).
        ii. Schedule Impact with extension of time to the final date of Substantial Completion. If there is an extension of time, ensure that all parties are aware, and the date is accepted. (In the "Explanation and Recommendation to the Owner" field).
        iii. Cost fields properly show:
            1. Initially submitted pre-negotiated cost (Revision 0) (Should always be greater than final).
            2. Final Cost with Prime Contractor (and Subs) Mark Up/OH&P.
            3. Final Cost without Prime Contractor (and Subs) Mark Up/OH&P.
        iv. All Comment fields correctly show the official history between CM, Architect, and Contractor.
        v. **"Explanation and Recommendation to Owner (By CM/AE):"** Is filled out for:
            1. Record justification of why the Change Order/Allowance is needed.
            2. To be processed as a Change Order or Allowance.
            3. Accepted Dollar Amount.
            4. Accepted Schedule Impact/Extension of Time or indicate no Extension to the Final Substantial Completion Date.
    c. Add the costs to the SOV/Cost Codes: Select "Schedule of Values" Tab -> Edit.
        i. Add a single line item for the Accepted PCO Amount:
            1. Prime Contract Line Item: Not Selected
            2. Cost Code: Select Contractors Cost Code.
            3. Sub Job: If multiple buildings, select cost code for specific building (even if allowance).
            4. Description: "CO #" "(SUBJOB)" "(PCO #R#)" "PCO Title (with PR/RFI#)"
                a. EX: "CO-WC4-01(ES) (PCO-WC4-05R1) Blocking at Windows (RFI-WC4-58)".
                b. 100 Character Limit Recommended.
            5. Cost Type: "All Costs"
            6. Enter Line item: QTY: "1", Unit: "LS", Unit Cost: Accepted Dollar Value.
            7. Press "+Add" then "Save". (Not Save & Email)
    d. Press **Show Workflow** -> **Respond** to open the review workflow.
    e. Select **Response Options:**
        i. "PCO Accepted - To be processed as a Change Order" if Change Order.
        ii. "PCO Accepted - To be processed as an Allowance" if Allowance.
        iii. "Revise and Resubmit" to Return to the CM Superintendent.
    f. Press **Submit** to Close the PCO. See instructions for Processing Change Order or Allowance.

PROCESSING CHANGE ORDERS OR ALLOWANCES

CM Created Change Order or Allowance Authorization (CM ADMIN STEP)

1. Open **Commitments Tool.**
2. Select the associated Contractor Contract Number -> **"+ Create**" -> "**Create Commitment CO**".
3. Sign with DocuSign **check box** to be used if DocuSign is being used, otherwise leave unchecked.
4. Enter the Change Order **Number** and **Revision** as "0". Use Allowance Prefix "AA-" if Allowance.
5. Enter the CO **Title** from PCO SOV Line-Item Description. Include relevant "Proposal Request" Number.
    1. "(SUBJOB)" "(PCO #R#)" "PCO Title (with PR/RFI#)"
    2. Example: "(ES) (PCO-WC4-05R1) Wood blocking at Windows (RFI-WC4-58)".
    3. Change Order Number not to be included in Change Order Title.
    4. 100 Character Limit Recommended.
    b. 100 Character Limit Recommended.
6. Leave **Private** checkbox set to private/checked.
7. Leave **Due Date**, **Invoiced Date**, **Paid Date,** and **Signed Change Order received Date** as blank.
8. Select the Contractor's Signature Contact as the **Designated Reviewer.** (Only one user).
9. Enter a detailed **Description** of the Change Order **including justification** for contract cost change and/or contract time change. This can come from the **"Explanation and Recommendation to Owner (By CM/AE):"** field from the PCO.
10. Leave the **Executed** check box unchecked until all signatures are received.
11. If there is a **Schedule Impact** to the final Substantially Completion Date only, then enter in the number of days delayed. If none, enter "0" Days.
12. Select the Accepted PCO to Add in to **Potential Change Orders** drop down.
13. The general **Attachments** field is reserved for replacement Change Order coversheets with signed sheets. Leave empty until these are received later. If there is a document in this field, it will replace the Procore Form.
14. Add the PCO PDF export, and any additional back up to the **Back Up Attachments** field. To be added behind cover.
15. Update the **Substantial Completion Date** if changed, otherwise enter the previous Substantial Completion Date.
16. Select applicable **To be Processed as: Change Order / Allowance**. (Determines which form is exported).
17. Enter in the accepted "**Total Cost"**, and "**Original Submitted Negotiated Cost: ($)"** (PCO Revision 0 Cost)
18. If Allowance is being processed, fill in Allowance Cost Values #1-6. Confirm all calculations are correct.
19. Press "**Create"** to create the Change Order or Allowance. (Not Distributed for Signature yet.)
20. Export the PDF to **verify** the Change Order or Allowance Authorization is properly assembled.
21. See Processing Allowance Instructions to **Add Allowance onto Contractor's** Invoice SOV.

CM Send Change Order or Allowance Authorization for Signature (CM ADMIN STEP)

Signature Order: Construction Manager-> Architect -> Contractor -> Owner. (Save Executed Document to OneDrive)

If Using Procore's Signature Workflow (No DocuSign, Manual Emails, or Bypass Processes)

1. Upload the CM Signed Coversheet to the Change Order **Attachments Field**.
2. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
3. Press **Respond** to open the review workflow.
4. Select "Reviewed and Accepted" to send to the first Signature Step/First Signature Assignee(s).
5. Press **Submit** to send the Chage Order or Allowance to the next signature party.
6. The Assignee should return the Change Order/Allowance Package with a Signed Coversheet to be swapped with the unsigned Change Order/Allowance.
    a. If the Architect has additional Documents: (Added back, SED Sheets, or owner CO/AA Coversheet), they can be sent to the Construction Manager via the Workflow Attachments.
7. Download the Workflow Attachments (Signed Cover Sheet or Back Up). Re-upload to the Change Order/Allowance **Attachments** field, or **Back Up Attachments** field as applicable, so the CO/AA is updated.
8. Repeat steps above by responding to the workflow after each CM COMPILED SIGNATURE step with "Reviewed and Accepted".
9. Once Change Order/Allowance is Executed with all 4 Signatures, and is in "CM COMPILED SIG. (OWNER)" Step, use response options:
    a. "PCO Accepted - To be processed as a Change Order".
    b. "PCO Accepted - To be processed under Allowance".
    c. "Revise and Resubmit" Response sends it back to the previous step.

If Using DocuSign (No Manual Emails, or Bypass Processes)

1. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
2. Press **Respond** to open the review workflow.
3. Select "Send to DocuSign" response option to set the Procore Workflow Status to DocuSign. Then press "Submit".
    a. If Additional Architect Back Up Documents are needed and not being received through DocuSign, use" Obtain AE CO/AA Back Up Documents" Response Option.
4. "Edit" the Change Order/Allowance, and at the bottom, press "Complete with DocuSign" Button.
5. Once sent, in the DocuSign Bar at the top, press "Edit" to go to DocuSign. (Not the gray Change Order edit button).
6. In DocuSign, continue through Process of setting up signatures, adding recipients, set signing order, view only/receive copy recipients. Templates/Custom Fields can be used to automate this process.
7. Send the Document through for Signature.
8. Once completed in DocuSign, review that the final PDF is correct.
9. Press Show Workflow -> Respond and select response options and then press "submit" to Close the C.O./A.A.
    a. PCO Accepted - To be processed as a Change Order.
    b. PCO Accepted - To be processed under Allowance.

If Using CO/AA Bypass (No DocuSign or Procore Signature workflow)

1. Verify the Change Order or Allowance has been fully executed outside of Procore with all signatures.
2. Edit the Change Order / Allowance and upload the fully executed PDF into the Change Order Attachments Field.
3. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
4. Press **Respond** to open the review workflow. Select Applicable Response options below, then press "submit" to close the C.O./A.A.
    a. CM CO Bypass Approval (ADMIN ONLY)
    b. CM AA Bypass Approval (ADMIN ONLY)

CM Send Change Order or Allowance Authorization for Signature (CM ADMIN STEP)

Signature Order: Construction Manager-> Architect -> Contractor -> Owner. (Save Executed Document to OneDrive)

If Using Procore's Signature Workflow (No DocuSign, Manual Emails, or Bypass Processes)

1. Upload the CM Signed Coversheet to the Change Order **Attachments Field**.
2. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
3. Press **Respond** to open the review workflow.
4. Select "Reviewed and Accepted" to send to the first Signature Step/First Signature Assignee(s).
5. Press **Submit** to send the Chage Order or Allowance to the next signature party.
6. The Assignee should return the Change Order/Allowance Package with a Signed Coversheet to be swapped with the unsigned Change Order/Allowance.
    a. If the Architect has additional Documents: (Added back, SED Sheets, or owner CO/AA Coversheet), they can be sent to the Construction Manager via the Workflow Attachments.
7. Download the Workflow Attachments (Signed Cover Sheet or Back Up). Re-upload to the Change Order/Allowance **Attachments** field, or **Back Up Attachments** field as applicable, so the CO/AA is updated.
8. Repeat steps above by responding to the workflow after each CM COMPILED SIGNATURE step with "Reviewed and Accepted".
9. Once Change Order/Allowance is Executed with all 4 Signatures, and is in "CM COMPILED SIG. (OWNER)" Step, use response options:
    a. "PCO Accepted - To be processed as a Change Order".
    b. "PCO Accepted - To be processed under Allowance".
    c. "Revise and Resubmit" Response sends it back to the previous step.

If Using DocuSign (No Manual Emails, or Bypass Processes)

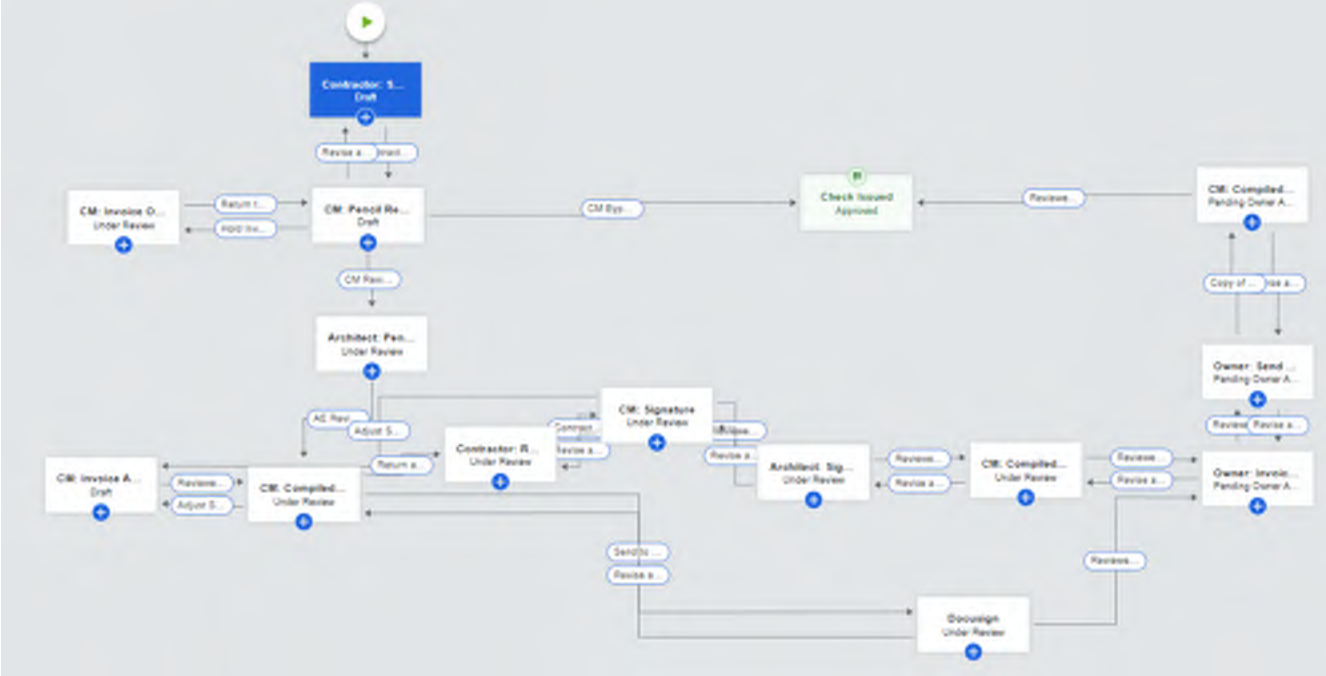
1. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
2. Press **Respond** to open the review workflow.
3. Select "Send to DocuSign" response option to set the Procore Workflow Status to DocuSign. Then press "Submit".
    a. If Additional Architect Back Up Documents are needed and not being received through DocuSign, use" Obtain AE CO/AA Back Up Documents" Response Option.
4. "Edit" the Change Order/Allowance, and at the bottom, press "Complete with DocuSign" Button.
5. Once sent, in the DocuSign Bar at the top, press "Edit" to go to DocuSign. (Not the gray Change Order edit button).
6. In DocuSign, continue through Process of setting up signatures, adding recipients, set signing order, view only/receive copy recipients. Templates/Custom Fields can be used to automate this process.
7. Send the Document through for Signature.
8. Once completed in DocuSign, review that the final PDF is correct.
9. Press Show Workflow -> Respond and select response options and then press "submit" to Close the C.O./A.A.
    a. PCO Accepted - To be processed as a Change Order.
    b. PCO Accepted - To be processed under Allowance.

If Using CO/AA Bypass (No DocuSign or Procore Signature workflow)

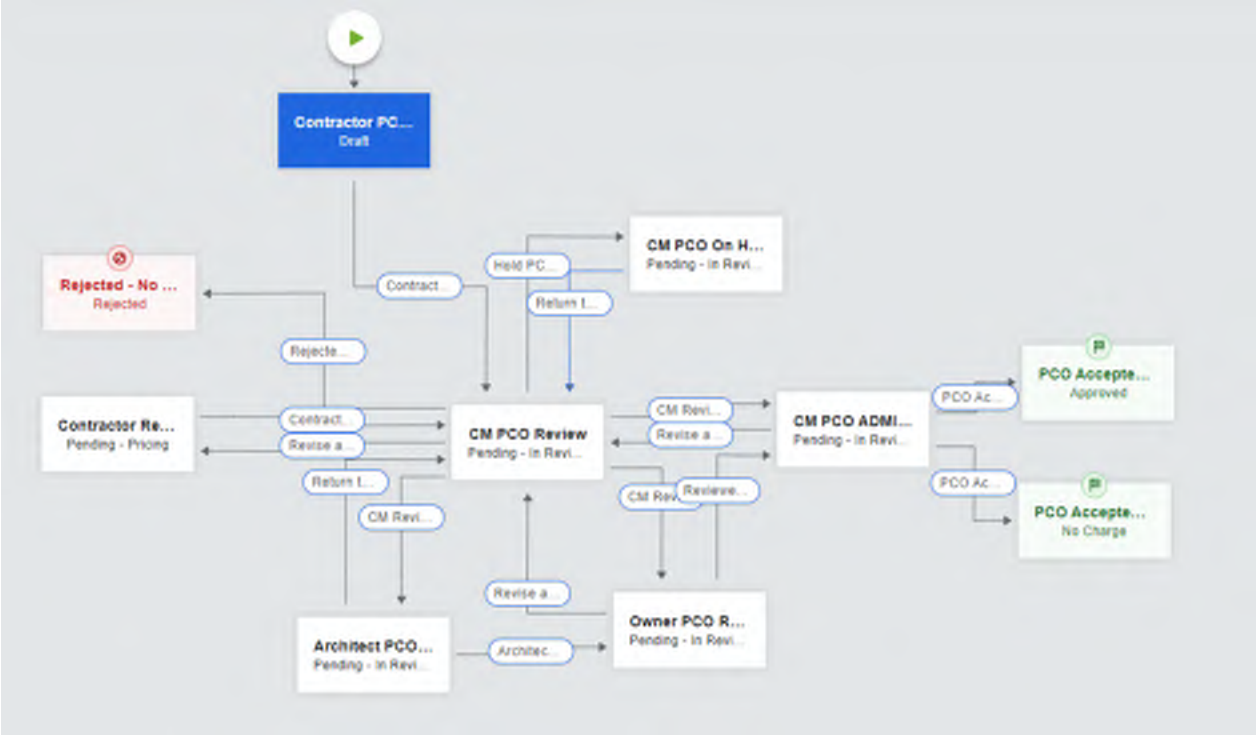
1. Verify the Change Order or Allowance has been fully executed outside of Procore with all signatures.
2. Edit the Change Order / Allowance and upload the fully executed PDF into the Change Order Attachments Field.
3. To submit the created C.O./A.A. to the next step, press **"Start Workflow",** then "**Show Workflow.**"
4. Press **Respond** to open the review workflow. Select Applicable Response options below, then press "submit" to close the C.O./A.A.
    a. CM CO Bypass Approval (ADMIN ONLY)
    b. CM AA Bypass Approval (ADMIN ONLY)

Illustrated Financial Workflows for Invoices, Potential Change Orders, and Change Orders

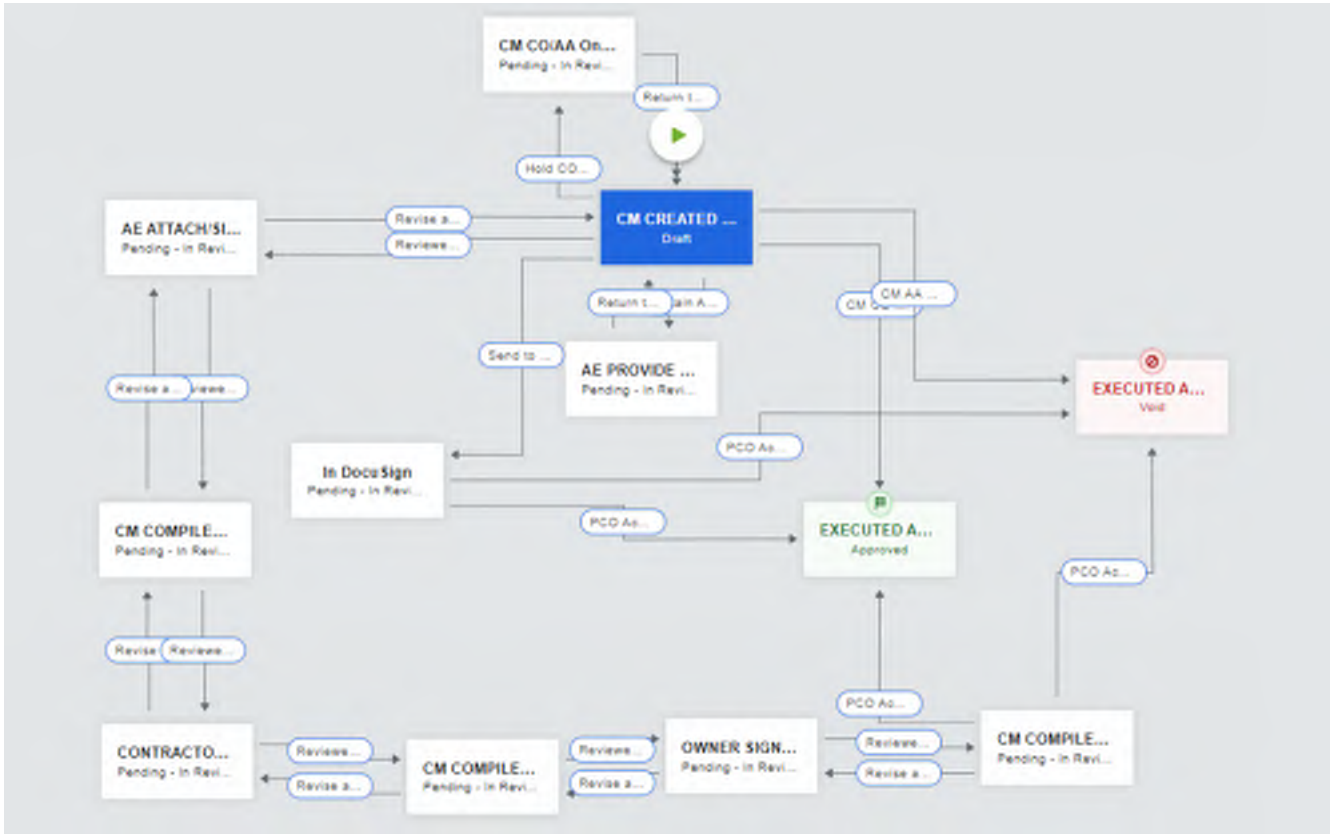
Invoice Workflow:



Potential Change Order Workflow:



Change Order Workflow:



END OF SECTION 013100.01

SECTION 01 31 15

COORDINATION AMONG MULTIPLE PRIME CONTRACTORS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes preparation of coordination drawings for architectural, structural, mechanical, plumbing, fire protection, fire alarm, lighting, information technology, security, and electrical Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for administrative provisions for coordinating construction operations.

2. Division 01 Section "Closeout Procedures" for project record drawing requirements.

1.2 DEFINITION AND INTENT

A. The Contract Drawings are diagrammatic only and are not intended to show the alignment, exact physical locations, or configurations of such Work. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. When possible, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.

B. Coordination drawings are drawings prepared by Contractor that superimpose Work of multiple trades involved in the construction process. Coordination drawings indicate systems and components to be installed by the Contractor with the intention to maximize clear height and free area in Ceiling Cavities, Mechanical Rooms, Electrical Rooms, Boiler Rooms, and Plumbing/Water Rooms; to allow for proper and adequate equipment service clearances, minimize space required by shafts and chases and provide the most efficient functioning and use of materials possible while complying with the final performance and finished appearance required by the Contract Documents.

C. Coordination drawings are intended to show the relationship and integration of different construction elements that require coordination during fabrication or installation to fit in the space provided, to function as intended, and to present the intended final finished appearance.

D. The Contractor shall manage the process so that each trade/ sub-contractor provides all required information in a timely manner. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. The CPM Schedule specified elsewhere in Division 01 Section "Construction Progress Documentation" shall include the submission of Coordination Drawings. The same shall demonstrate how the Contractor intends to integrate the submission of Coordination Drawings to suit the overall project schedule.

E. Contractor shall maintain equipment access and pathways as indicated on the Drawings. Floor space in MEP equipment rooms shall be maintained as indicated on the Architectural Drawings. Contractor shall clearly indicate access and floor space to be maintained in coordinated shop drawings submitted to the Owner and Architect as per the Specifications.

F. Definitions:

1. Building Information Model (BIM): A digital representation of physical and functional characteristics of a facility.

2. Coordination Model: Building Information Model(s) that demonstrates and communicates the facility data necessary to procure, fabricate, schedule, or construct the Project.

3. Coordination Report: A report developed to communicate and demonstrate that the facility elements have been properly coordinated and identify areas where issues may still exist.

4. Design Intent Model: Building Information Model(s) that demonstrates and communicates the creative objectives of the designer.

5. Fabrication/Shop Drawing: Drawing generated by the contractor from a Coordination Model based on the contract documents that communicates the information necessary to fabricate facility elements. Fabrication/Shop Drawings typically contain one system and are intended for use of trade personnel to fabricate, assemble, and install facility elements.

6. Facility Breakdown Structure: a system-oriented hierarchical decomposition of a facility into smaller components. Typically, the facility breakdown structure is based on disciplines, trades, described by Master Format.

7. Interference: Spatial conflict between facility elements.

1.3 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. Refer to Division 01 Section "Submittal Procedures" for availability of and use of Architect's CAD Background Drawings.

1.4 COORDINATION RESPONSIBILITIES OF EACH PRIME CONTRACTOR

A. **Each Prime Contractor** is required to engage a **qualified drafting agency** capable of producing coordination drawings and models utilizing various industry standards and file formats including but not limited to: (Revit, AutoCAD, etc.). Each Prime Contractor is responsible for providing their own clash detection process for items of their work and any work shown on the Coordination Model from previous iterations by other Prime Contractors.

B. In **Renovation Construction** (where no new walls or floors are being constructed):

1. Each Contractor is required to provide field verification of all scheduled work to confirm installation fitment within existing conditions.

2. Each Contractor is required to submit coordination drawings depicting items listed in 013115: 3.2. Locations to be referenced using field marked reference points in the existing building in lieu of building column lines.

3. Each Contractor is to provide coordination drawings/models in existing spaces to confirm fitment/access and class detection between other Contractors prior to release of material installation.

4. Contractors providing equipment to be powered by existing power are to verify in field the existing power supplied meets the requirements of the new equipment. The Electrician providing new power for equipment is to provide field verification of existing power conditions with respect to the new equipment and power scheduled on the Contract Drawings/Approved Equipment Submittals.

C. **For <u>ALL</u> Construction: Each Contractor is required to provide a field mark out of their work** to be followed by other Contractors who are to provide openings, penetrations, wiring connections, structural support, trench layout, and any other work needed by a following Contractor. Layout to be based off the approved Shop Drawings generated from the Multi Trade signed off Coordination Model. Any openings/steel support required to be installed shall be marked out on the underside of the Roof Deck by the contractor installing the items requiring the opening/support.

D. The **Mechanical Contractor** will take on the additional responsibility of overseeing the coordination modeling/drawing process and provide additional clash detection reports of all models by other Prime Contractors using the BIM Modeling Software for <u>New Construction Building Work</u>. The Mechanical Contractor is to communicate any issues that arise from other Contractors not fulfilling their obligations to the Construction Manager.

E. The Construction Manager will provide direction and communications between each Prime Contractor and schedule coordination meetings as required.

F. **Coordination Model(s):** Each Contractor is to prepare and submit Coordination Drawings/Model(s) as scheduled on the Project Milestone Schedule. Coordination Model(s) are to be based on the facility breakdown structure of the Contract Drawings

and/or Design Intent Model. Contractors are to perform all work utilizing 3D modeling software in order to facilitate seamless coordination with BIM workflows. All design elements should be produced three-dimensionally in programs that can output file formats supported by Autodesk Navisworks. Coordination Model(s) are to be submitted using Autodesk Navisworks with all disciplines.

1. Coordination Model(s) are to be submitted prior to fabrication, and installation of any element within the area represented within the Coordination Model(s).

2. Fabrication/Shop Drawings and Construction Model(s) are to be integrated into the Coordination Model(s) or otherwise referenced in the Coordination Model(s).

G. Coordination Drawings. Each Prime Contractor is to export Coordination Drawings documents from the BIM authoring application in a (.pdf) for distribution and review by the Construction Manager/Architect/Engineer.

H. Coordination Meetings: Contractors are to attend coordination meetings bi-weekly or as required by the construction manager until the Coordination process is complete. Each Contractor is to provide details of the status of their respective portions of the coordination drawings and provide a list of any current conflicts or clash detection items at each meeting.

I. Coordination Drawing Sequence in **New Construction** (or as directed by the Construction Manager):

1. The Architect **may, when available,** provide the Design Intent Model (.RVT) but does not alleviate the responsibility of each Contractor to provide their own self-generated model.

2. The General Contractor shall provide the structural coordination model/coordination drawing depicting the Structural Elementals of the building (Steel, Concrete, Masonry, Floors, Roofs.

3. The General Contractor shall add to the coordination model, separate layers for the Architectural Contract work for partitions, walls, ceilings, soffits and other items as applicable. The General Contractor shall self-perform their own clash detection between the Structural and Architectural Items prior to sending the model to the next Contractor.

4. The coordination model shall then be sent to the Mechanical Contractor who will be designated the responsible Contractor to incorporate the models of the following trades and provide dedicated clash detection of all Models. The Mechanical Contractor will then detail the Mechanical items (Piping, Ductwork, and Equipment) and self-perform clash detection between Mechanical and General Contractor's Items. Mechanical Contractor to resolve clashes prior to passing the model to the Plumbing Contractor.

5. The Plumbing Contractor will then detail the Plumbing items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash detection.

6. The Electrical Contractor will then detail the Electrical items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash Detection.

7. Any other specialty Contractor will then detail their respective new work items onto the model and then return to the Mechanical Contractor for Clash Detection.

1.5 SUBMITTALS

A. Coordination Drawings are not a replacement for shop drawings specified in the technical specifications or the Record Drawings required in Division 01. Once the Coordination model is complete and all conflicts are resolved, each Contractor is responsible to submit Shop Drawings of their respective work for final approval. Circle and clearly note deviations from Contract Documents with reason for deviation stated. Contractor failure to identify deviations from the Contract Documents does not alleviate the Contractors responsibility to provide installations per the Contract Documents.

B. Coordination Clash Detection Report:

1. Prepare and submit a written Coordination Report generated from the Coordination Model(s) prior to fabrication, and installation of any facility element within the area represented within the Coordination Model(s). Develop Coordination Reports identifying outstanding issues after the development of the Coordination Model(s), including but not limited to:

Clashes:

Itemize number of clashes.

Clash Category

Describe clashes.

Describe the resolution of clashes and other conflicts.

Design changes.

Differing site conditions.

Hazardous, Maintenance Accessibility, or Safety related issues.

2. The report shall be organized by CSI Master Format 2016 specification section or by trade.

3. The issues identified within the Coordination Clash Detection Report are to be addressed by the Contractor in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.

4. The Contractor is solely responsible for the cost of remedying any clashes that could have been discovered during the clash detection process.

1.6 PROJECT CONDITIONS

A. Maintain marked up set of coordination drawings at Project site available for reference by Owner and Architect.

B. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION OF COORDINATION DRAWINGS IN NEW CONSTRUCTION.

A. The intent of the Coordination Model(s) is to communicate the necessary information to construct the facility including size, location, and arrangement of both existing to remain and new elements and to incorporate the as-built conditions.

B. Develop Coordination Model(s) based upon Contract Documents, Design Intent Model(s), and verified existing conditions.

C. Coordination Model(s) are to have a consistent origin that can be referenced to a real-world datum or benchmark.

D. Prepare coordination drawings for Project using BIM: Revit or similar coordination documentation overlay drawings indicating coordination of the project.

E. The Construction Manager will review and direct coordination responsibilities for the preparation of the coordination drawings.

1. The Construction Manager will direct each Prime Contractor for the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components.

3.2 INFORMATION REQUIRED IN COORDINATION DRAWINGS/MODEL(S) –

The coordination Model(s) will include, but not be limited to, the following elements with all necessary intelligence included to produce plans, sections, elevations, riser diagrams, and schedules as applicable:

Locations (center points and edges of coordination element) to be depicted with locations referencing Column Lines and heights referencing Above Finish Floor Heights.

A. Structural Work Information Required in Coordination Drawings by General Construction Contractor:

1. All Structural Steel and Miscellaneous Steel.
2. Concrete, Masonry, and Foundation Walls. (Depict Sleeves and Structural Support for all utilities, piping, and conduit passing through the concrete/masonry walls).
3. Floor Assembly (Including Slab edge locations and locations of sleeves dimensioned from building lines and floor lines).
4. Roof Assembly (Include Roof Drains depicted and coordinated with Tapered insulation).
5. Structural Support for Roof Mounted Equipment by this Contract and Other Prime Contractors.
6. Structural Support for Floor/Roof Opening and sleeve locations including required openings not indicated on Contract Documents.

B. Architectural Work Information Required in Coordination Drawings by General Construction Contractor:

1. Exterior Wall Layout for Building enclosure.
2. Interior Wall and Partition Layout. Incorporate Concrete and Masonry Walls.
3. Depict Wood blocking and Access Doors.
4. Doors, including door swing area.
5. All Ceilings Systems including support for support system. Depict final ceiling grid layout for Acoustical Ceiling.

C. Plumbing Work Information Required in Coordination Drawings by Plumbing Construction Contractor:

1. Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.

2. Sizes, bottom elevations, locations of underground piping. Indicate Point of Connection for Site Utility Piping Connections and sleeve locations through building foundation/exterior walls.

3. Support of all roof-mounted plumbing piping and equipment.

4. Depict all Plumbing Valves, Drains, Vents Specialty Items.

5. Required space to install, service, access, and maintain all plumbing mechanical items and systems.

6. Sizes and locations of Floor Drains, Floor Sinks, cleanouts, and any other items embedded in the Floor.

7. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

8. Wood Blocking Locations required to support the work of this trade (for Plumbing Fixtures and other wall mounted Plumbing items.

9. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.

D. Mechanical Work Information Required in Coordination Drawing by Mechanical Construction Contractor

1. Sizes and bottom elevations of ductwork, piping with insulation thickness, flanges, supports, and hangers included.

2. Depict all Volume, Motorized, Fire Dampers, and Ductwork Access Doors.

3. Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.

4. Depict all HVAC Valves, Drains, Vents Specialty Items.

5. Indicate Size and Layout of all floor/roof openings and sleeves for this contract. Indicate size of duct/pipe chase partition sizes.

6. Indicate Size and Layout of all Interior/Exterior Wall Openings and Sleeves for this contract.

7. Locations for support of all roof-mounted HVAC piping, ductwork, and equipment. (Depict all HVAC Equipment: Sizes, support, layout, access/service area, and Provide HVAC roof curb sizes and locations including Pipe Portals, Duct Curbs, Roof Rails, and other Roof Top Items.)

8. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.

9. Power and Wiring Connection Locations for Equipment.

10. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

11. Wood Blocking Locations required to support the work of this trade.

E. Electrical Work Information Required in Coordination Drawings by Electrical Construction Contractor (including telecommunications, data, security, lighting, and fire alarm systems scoped under the Electrical Contract):

1. Runs of vertical and horizontal conduits 1-1/4-inch diameter and larger, and all cable trays, indicate bottom and sizes of horizontal conduit and cable trays.
2. Sizes, bottom elevations, locations of underground conduits. Indicate Point of Connection for Site Utility Conduit Connections and sleeve locations through building foundation/exterior walls.
3. Location of pull boxes and junction boxes, dimensioned from column centerlines. All to be placed in accessible locations.
4. Light fixture locations and sizes.
5. Wall and Ceiling Mounted Device Layout.
6. Panelboard, switchboard, transformer Layout.
7. Depict all roof mounted conduits/supports and equipment under this trade. (Coordinate with other Contractors to share pipe portals and equipment electrical raceways.)
8. Required space to install, service, access, and maintain all electrical items and systems.
9. Power and Wiring Connection Locations for Equipment.
10. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
11. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
12. Wood Blocking Locations required to support the work of this trade (Including Door Holders and other surface mounted equipment).

F. Fire Protection System Information Required in Coordination Drawings by Contractor responsible for providing Fire Protection:

1. Locations of standpipes, valves, mains piping, branch lines, pipe drops, building entry piping, Inspection Test Locations, Fire Protection Specialty Piping, and sprinkler heads.
2. Bottom elevation of main and branch lines, including Hangers and Supports.
3. Wood Blocking Locations required to support the work of this trade.
4. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

G. Building Automation Controls Work Information Required in Coordination Drawings by Contractor Responsible for providing Building Automation Controls.

1. Thermostats and wall/ceiling mounted controls devices.
2. Wall Mounted Panels and controllers.
3. Wood Blocking Locations required to support the work of this trade.
4. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

H. Casework and Furniture Work Information Required in Coordination Drawings by Contractor Responsible for providing Casework and Furniture.

1. All Casework shown on Contract Drawings.
2. Depict all connections for Electrical and Communications work.
3. Depict all Plumbing Connections and Cut outs for Plumbing items to be installed in casework.
4. Depict all other connections by other Contractors to be installed in casework.
5. Wood Blocking Locations required to support the work of this trade.

I. Telecommunication/Low Voltage Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.

1. Wall Mounted Devices.
2. Sleeve Locations for all Floor/Roof Openings.
3. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

J. Security Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.

1. Wall mounted panels and controllers.
2. Wall mounted devices.
3. Wood Blocking Locations required to support the work of this trade.

K. Equipment Work Information Required in Coordination Drawings by Contractor Responsible for providing Equipment Work.

1. Wall and Ceiling mounted devices, panels, and controllers.

2. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

3. Wood Blocking Locations required to support the work of this trade.

4. Power and Wiring Connection Locations for Equipment.

3.3 SITEWORK COORDINATION

A. The Contractor responsible for providing Sitework shall prepare Coordination Drawings depicting all sitework and utility work that is to be coordinated between other Contractors.

B. Items to be provided the following in the Coordination Drawings/Model:

1. Utilities to be shown by the Sitework Contractor include but not limited to: Storm Piping, Footing Drains, Sanitary/Sewer Piping, Watermain piping, Fire Protection Piping, Concrete Structures, Electrical and Low Voltage Conduit, Conduit Duct Banks, Concrete Structures. Indicate Tops/Bottoms, and sizes of utilities.

2. Depict Utility Point of Connection locations.

3. Sitework Contractor to confirm heights/depths of utilities will be at correct elevations with respect to the finished grade and finished sitework.

4. Provide drawings coordinating concrete sidewalks and stairs with connection to the building or other existing concrete pathway connections.

3.4 ELECTRICAL POWER AND WIRING COORDINATION

1. All Prime Contractor's providing equipment and devices to be wired and connected to by the Electrician shall provide the contractor designated of wiring the equipment/devices with wiring diagrams and power requirements.

2. The Electrician shall not release or install materials to power any equipment until the electrician has reviewed and confirmed the power requirements of the engineer approved equipment submittal submitted by the equipment installer and verified the power supplied from the panel/breaker will meet the requirements of the approved equipment.

3. The Equipment supplier will indicate on the coordination drawings the proposed locations of any wall or ceiling devices.

4. The Contractor furnishing Electrified Door Hardware, or Doors/Frames scheduled to receive electrified Door hardware or Door Controls/Security shall provide in new storefronts/door frames; internal raceway and drag wire from all electrified hardware devices to a concealed location above the ceiling in the building. The Door/Frame installer shall also notify the Construction Manager and Contractor

responsible for providing hardware wiring when storefront/door frames installation is to be scheduled prior to wiring installation.

3.5 CONFLICTS IN COORDINATION DRAWINGS

A. The issues identified within the Coordination Clash Detection Report are to be addressed by the Contractor in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.

1. Each Prime Contractors shall revise their respective portions of the Coordination Drawings to eliminate the collisions and interferences identified.

2. Each Prime Contractor shall determine that all work can be installed without interference.

3. Each Prime Contractor shall approve the revised Coordination Drawings in writing indicating approval of installation coordination and clearances.

3.6 CONTRACTOR COORDINATION PARTICIPATION REQUIREMENT

A. All Contractors are required to provide information and fulfill coordination obligations identified in this specification section.

B. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings. Additional costs by other Contractors to change other Contractors conflicting work if required will be the responsibility of the Contractor that failed to provide their obligated coordination responsibilities.

C. If a contractor fails to perform coordination services under this specification section when scheduled and within 7 days upon notice and request by the Construction Manager, in which results in a delay to another contractors scheduled release of work, then the Owner retains the right to hire an outside detailing services/surveying services to review the work of the Contract and provide coordination services to other Contractors and deduct costs from the Contractor who has failed to provide the contractual scheduling services. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required coordination information/services after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide the coordination administrative services on behalf of the Contractor.

END OF SECTION 013115

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. Event: The starting or ending point of an activity.

C. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

D. Major Area: A story of construction, a separate building, or a similar significant construction element.

E. Milestone: A key or critical point in time for reference or measurement.

1.3 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with

project names and addresses, names and addresses of architects and owners, and other information specified.

B. Pre-Construction Photographs: Contractor's to submit to Procore Preconstruction photos as a Record Submittal. Refer to Selective Demolition Specification.

C. Construction Photographs: Contractors to take daily progress photos, as well as completion photos of all areas as they are completed and turned over to the owner. Submit date/time-stamped digital images on Procore within seven (7) days of taking photographs.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

B. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Submittal Schedule to be submitted on form specified by the Project or as directed by Construction Manager.

2. Submittal Schedule items to be broken down into a list by individual submittal document. **All expected individual closeout submittals** to also be included in the Submittal Schedule prior to approval. Closeout Submittals may include but not limited to: Maintenance Manuals, Record Drawings/Specifications, Warranties, Test Reports, Training Documentation, Maintenance Materials.

3. Submittals to be grouped into the following types: Product Information/Product Data, Shop Drawings, Samples/Mockups, and Closeout Documents: Maintenance Manuals, Record Drawings/Specifications, Warranties, Test Reports, Training Documentation, Maintenance Materials; and type "other".

4. If the Contractor fails to provide a detailed submittal schedule by due date on Milestone Schedule or within 14 days upon request by the Construction Manager, then the Owner retains the right to hire outside services to review the specifications and generate the initial list of expected submittal and closeout items and deduct costs from the Contractor who has failed to provide the contractual submittal schedule. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required submittal schedule after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide these administrative services on behalf of the contractor.

B. Need to include Closeout Submittals (Record Drawings/Specs, O&M's

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Within thirty (30) days after Notice to Proceed:
   a. Structural Steel,
   b. Soil proctors,
   c. Concrete mix designs,
   d. Billet steel shop drawings,
   e. HVAC components,
   f. Electrical panels,
   g. and all other submittals required to commence work and long-lead items critical to job schedule
   h. No payment will be made to contractor until complete schedule of submittals has been received and accepted by owner.

3. Balance of Submittals - within **sixty (60) days** after Notice to Proceed

   a. Time Limit Excludes: Closeout Documents due no later 2 weeks after Substantial Completion.

   b. Time Limit Excludes: Coordination Drawings due as indicated per Project Milestone Schedule.

4. Upon approval by the Architect, non-critical submittals may be transmitted later.

C. Prepare a written schedule (or log) showing each specification item to be submitted, projected date into architect for review, lead time for procurement and required on job date.

D. Distribution: Following response to the initial submittal, print and distribute copies to the Construction Manager for distribution to the Architect, Owner, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

E. Schedule Updating: Revise the submittal schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Contractor Construction Project Schedule: Each Prime Contractor is required to engage a qualified CPM Construction Scheduling Service to generate (or provide equivalent self-performed scheduling services with CM approval) and submit a construction schedule based on the dates of the Contract Milestone Schedule. See Construction Progress Documentation / Schedule Specifications for additional requirements.

1. Each Contractor's construction schedule is to be submitted for review and comment no later than 3 weeks after a Notice to Proceed for the work is issued.

2. Contractor Project Schedules are to be assembled in compliance with the Contract Milestone Schedule.

3. For the initial Construction Project Schedule, the Project Milestone Schedule is to be used as a basis for predecessor activities.

4. If there is schedule information pending from other Contractors to schedule an activity on the schedule, the Contractor shall indicate on the schedule the duration and sequence of the activity and further indicate the item as pending by others.

5. Include notes regarding activities that may impact other Contractor's activities.

6. Each Contractor has the responsibility to respond to questions from other Contractors with regards to the sequence and completion dates/durations of activities.

7. An updated Project schedule is to be included with each Application for Payment.

8. If the Contractor fails to provide a detailed construction schedule within 14 days upon request by the Construction Manager, then the Owner retains the right to hire CPM Scheduling Services to review the work of the Contract and generate detailed schedule information to perform the work of the contract to meet the date of substantial completion and deduct costs from the Contractor who has failed to provide the contractual scheduling services. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required schedule after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide the scheduling administrative services on behalf of the Contractor.

B. Master Construction Schedule: The General Construction Work Contract (Contract #1) is required to review all Construction Schedules submitted by the other Contractors and entities performing work on the Project and combine into a complete Master construction schedule that has been coordinated with all other work on the Project. The Master Construction Schedule shall be submitted no later than 2 weeks after all other Contractors have submitted their respective Construction Schedules.

1. If the Critical Path of the projected Substantial Completion exceeds the Substantial Completion date of the Milestone Schedule or other dates listed in the Milestone Schedule, then the contractor designated as the entity responsible for producing the master schedule is to identify the critical path items and notify the Construction Manager. If the conflict cannot be resolved, then a meeting is to be scheduled between each Contractor to review the resolution options which may require Contractors to provide additional Crews/Manpower.

2. Multiple Crews: To maintain the project schedule, each Prime Contractor is to provide multiple crews. Each crew is to be furnished with its own supervision, cranes, scaffold, and other means necessary to maintain the Project Schedule.

C. 2 Week Look Ahead Schedule: Each Contractor will be required to submit a detailed 2 week look ahead schedule that indicates which activities are scheduled each day for all periods each contractor is performing any amount of work.

D. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 3 weeks days after Notice to Proceed is issued.

1. Provide a separate time bar for each significant construction activity. Show ordering and delivery times of all long-lead equipment and materials. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contracting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

E. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.

F. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of payment requests.

1. Refer to Division 1 Section "PAYMENT PROCEDURES" for cost reporting and payment procedures.

G. Distribution: Following response to the initial submittal, print and forward copies to the to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

H. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

I. A project schedule is being specified, and all Prime Contractors shall comply with this schedule. The project schedule requires that the phases of the project be substantially complete by the dates indicated in the Construction Manager's milestone construction schedule included at the end of this section.

J. The owner reserves the right to adjust the project schedule from time to time during construction tom mitigate unavoidable problems and insure that the project completion date is achieved. Prime contractors shall comply with the adjusted Project Schedule without additional costs.

K. The milestone schedule is included at the end of this section.

L. Phasing of the work: The phasing plan specifies detailed Phasing requirements that must be followed by contractors for completion of work. The phasing plan is shown on the drawings.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site and submit duplicate copies to the Architect at weekly intervals:

1. List of subcontractors at Project site.

2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Emergency procedures.
10. Orders and requests of authorities having jurisdiction.
11. Change Orders received and implemented.
12. Construction Change Directives received.
13. Services connected and disconnected.
14. Equipment or system tests and startups.
15. Partial Completions and occupancies.
16. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Submittal of Daily Log of Construction Activities

1. Deliver a copy of the daily logs to the construction manager's site office at the end of every fifth day. Failure to do so will result in the owner withholding progress payments until the logs are submitted to date requested or owed.

2.4 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPEG format, with minimum sensor size of 1.3 megapixels.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the work progresses, indicate the Actual Completion percentage for each activity.

3.2 CONSTRUCTION PROGRESS PHOTOGRAPHS

1. All Prime Contractors are required to take Date and Time Stamped Preconstruction Photographs of all work areas prior to scheduling any work onsite:
    a. Indicate locations on photographs as needed to identify photograph location.
    b. Show existing conditions of all areas that might be misconstrued as damage caused by selective demolition operations. Submit to Construction Manager before Work begins.
2. All Prime Contractors are required to take daily progress photographs (Date and Time Stamped) of the work being completed under their respective contract.
    a. Indicate locations on photographs as needed to identify photograph location.
3. All Prime Contractors are required to take Date and Time Stamped "Final Photographs" of all completed work and completed work areas. The Contractor is required to protect installation of new work until these photographs are taken. Restore work that has been damaged due to lack of protection prior to Final Photographs being taken.
    a. Indicate locations on photographs as needed to identify photograph location.

3.3 CONSTRUCTION PROFESSIONAL PHOTOGRAPHS (BY GENERAL CONTRACTOR)

A. Photographer: Engage a qualified photographer to take construction photographs.

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Professional Photographs: Before starting construction, take four color photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

D. Periodic Construction Professional Photographs: Take four color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

E. Final Completion Construction Professional Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

END OF SECTION 01320

ATTACHMENTS:

MILESTONE CONSTRUCTION SCHEDULE
(TO BE PROVIDED AS AN ADDENDUM)

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents,

established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect

installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

   a. Provide test specimens representative of proposed products and construction.

   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

   a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections are explicitly assigned to the Owner.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Manufacturer’s responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Refer to Specification section 01450 for the list of required inspections.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. Any agencies which has the proper qualifications and certifications to perform the test and or inspection.

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes: "**Uniform Safety Standards for Maintenance Projects"** for maintaining a Certificate of Occupancy during construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENT

A. The occupied portion of any village building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

3.2 HAZARDOUS BUILDING MATERIALS

A. Surfaces that will be disturbed during renovation or demolition have been tested for lead and asbestos. Results of the testing are available, upon request, from the Owner.

3.3 GENERAL SAFETY AND SECURITY STANDARDS FOR CONSTRUCTION PROJECTS.

A. General safety and security standards for construction projects include the following:

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.

B. The Contractor will prepare a plan detailing how exiting required by the applicable building code will be maintained during construction. The plan shall indicate temporary

construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.

3.4 CONTROL OF CHEMICAL FUMES, GASES AND OTHER CONTAINMENTS DURING CONSTRUCTION

A. The contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by, including but not limited to, welding, gasoline or diesel engines, roofing, paving, or painting, to ensure they do not enter occupied portions of the building or air intakes.

1. Contractors shall provide a plan indicating how and where welding, gasoline engine, roofing, paving, painting or other fumes will be exhausted from the work site. Contractors shall provide all temporary means to assure that fresh air intakes do not draw in such fumes.

2. If any portion of the work will generate toxic gases that cannot be contained in an isolated area, the work shall be done when school classes and programs are not in session. The contractor shall include costs associated with this requirement in his bid. The building shall be properly ventilated and, the material shall be given proper time, as recommended by the manufacturer, to cure "off-gas" before re-occupancy.

3. The contractor shall maintain all manufacturers' Material Safety Data Sheets (MSDS) at the site for all products used in the project. Copies of the MSDS sheets shall be given to the Architect and to the School District. MSDS sheets shall be provided to anyone who requests them.

3.5 CONTROL OF OFF-GASSING DURING CONSTRUCTION

A. The General Work 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.

1. Contractor shall provide, in their schedules for work of the construction, proper time for "off-gassing" or volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, adhesives, paint, furniture, carpeting, wall coverings, and drapery. Manufacturers shall be contacted to obtain information regarding appropriate temperatures and times needed to cure or ventilate the product during use and before safe occupancy of the space can be assured. The contractor shall include the above-mentioned information and shall clearly highlight the information, as part of the shop drawing submittal.

2. Building materials or furnishings which "off-gas" chemical fumes, gases, or other contaminants shall be aired out in a well ventilated heated warehouse before it is brought to the project for installation or, the manufacturer's recommended "off-gassing" periods must be scheduled between installation and use of the space.

3. The contractor shall maintain all manufacturers' Material Safety Data Sheets (MSDS) at the site for all products used in the project. Copies of the MSDS sheets shall be given to the Architect and to the School District. MSDS sheets shall be provided to anyone who requests them.

3.6 ASBESTOS CONTAINING BUILDING MATERIALS

A. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. 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 exits 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, soffit or site 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.

C. For clearance sampling, the air sampling technician shall provide aggressive air sampling per Rule 56 and as follows: First direct the exhaust of a leaf blower, against all walls, ceilings, floors, ledges, and other surfaces in the work area. Continue agitation for at least five minutes per every 1,000 sf of floor space. Following this aggressive agitation, the air-sampling technician shall use at least one 20-inch fan per 10,000 cubic feet of work area space for continuous agitation. The fan shall be operated on low speed and pointed toward the ceiling. Sampling pumps shall be started after the fans are started and stopped before the fans are stopped.

1. Samples shall be logged on a permanently bound logbook at the laboratory. No whiteout will be used to make corrections.

2. All lab counts, data and analysis shall be recorded on a lab summary sheet for each sample.

3. All samples will be tested using TEM analysis.

3.7 LEAD CONTAINING BUILDING MATERIALS

A. Surfaces that will be disturbed by reconstruction need to have a determination made indicating "No Lead Present" prior to any material removal.

1. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details

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

END OF SECTION 01410

SECTION 01 42 00

REFERENCES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes an alphabetical listing of organizations and agencies that publish recognized industry standards referred to in the Contract Documents. It also includes definitions of construction-related terms that are not defined in the Construction Documents.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract. No such implied meaning will be interpreted to extend the Architect/Engineer's responsibility into the Contractor's area of construction supervision.

C. "Architect": Other terms including "Architect/Engineer" and "Engineer" have the same meaning as "Architect".

D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

E. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

F. "Furnish": Supply and deliver to Project Site or other designated location, all materials and equipment so specified, ready for unloading, unpacking, assembly, installation, and similar operations or other form of incorporation into the Project, and maintained ready for use. Supply and deliver products requiring additional or supplemental fitting, assembly, fabrication, or incorporation into other elements of the Project directly to the fabricator, installer or manufacturer as required.

G. "Include": When used in any form other than "inclusive," is non-limiting and is not intended to mean "all-inclusive."

H. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

I. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

J. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. "Product": As used includes materials, systems and equipment.

L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

M. "Provide": Furnish and install, complete and ready for the intended use.

N. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

O. "Supplier": Any person or organization who supplies materials or equipment for the work, including that fabricated to a special design.

P. "Utility": Any gas, steam, water, sanitary sewer, storm sewer, electrical or other such service".

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the

context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1.	ADAAG	Americans with Disabilities Act (ADA) www.access-board.gov	(800) 872-2253 (202) 272-5434
2.	CFR	Code of Federal Regulations www.access.gpo.gov/nara/cfr	(888) 293-6498 (202) 512-1530
3.	CRD	Handbook for Concrete and Cement www.wes.army.mil	 (601) 634-2355
4.	DOD	Department of Defense Specifications and Standards //astimage.daps.dla.mil/online	 (215) 697-6257
5.	FED-STD	Federal Standard	(See FS)
6.	FS	Federal Specification Defense Automated Printing Service //astimage.daps.dla.mil/online General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm National Institute of Building Sciences www.nibs.org	 (215) 697-6257 (202) 619-8925 (202) 289-7800
7.	FTMS	Federal Test Method Standard	(See FS)
8.	MILSPEC	Military Specification and Standards //astimage.daps.dla.mil/online	 (215) 697-6257
9.	UFAS	Uniform Federal Accessibility Standards www.access-board.gov	(800) 872-2253 (202) 272-5434

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1.	AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
2.	AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
3.	AAMA	American Architectural Manufacturers Assoc www.aamanet.org	(847) 303-5664
4.	ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
5.	ADC	Air Diffusion Council www.flexibleduct.org	(312) 201-0101
6.	AGA	American Gas Association www.aga.org	(202) 824-7000
7.	AIA	American Institute of Architects (The) www.e-architect.com	(202) 626-7300
8.	AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
9.	AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
10.	AMCA	Air Movement & Control Association Int'l, Inc. www.amca.org	(847) 394-0150
11.	ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
12.	APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
13.	ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
14.	ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
15.	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
16.	ASME	ASME International www.asme.org	(800) 843-2763 (212) 591-7722
17.	ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
18.	ASTM	American Society for Testing and Materials www.astm.org	(610) 832-9585
19.	AWCI	AWCI International www.awci.org	(703) 534-8300

20.	AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
21.	AWPA	American Wood-Preservers' Association www.awpa.com	(817) 326-6300
22.	AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
23.	BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
24.	BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
25.	CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
26.	CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
27.	CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
28.	CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
29.	DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
30.	EIA/TIA	Electronic Industries Alliance / Telecommunications Industry Association www.eia.org	(703) 907-7500
31.	FGMA	Flat Glass Marketing Association	(See GANA)
32.	FMG	FM Global www.fmglobal.com	(401) 275-3000
33.	GA	Gypsum Association www.gypsum.org	(202) 289-5440
34.	GANA	Glass Association of North America www.glasswebsite.com/gana	(785) 271-0208
35.	ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(508) 394-4424
36.	IEEE	Institute of Electrical and Electronics Engineers, Inc. www.ieee.org	(212) 419-7900
37.	IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
38.	IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234

39.	ITS	Intertek Testing Services www.itsglobal.com	(800) 345-3851 (607) 753-6711
40.	LSGA	Laminated Safety Glass Association	(See GANA)
41.	NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
42.	NAIMA	North American Insulation Manufacturers Assoc. www.naima.org	(703) 684-0084
43.	NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
44.	NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
45.	NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
46.	NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
47.	NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372
48.	NGA	National Glass Association www.glass.org	(703) 442-4890
49.	NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
50.	PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
51.	PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (508) 230-3516
52.	RFCI	Resilient Floor Covering Institute	(Contact by mail only)
53.	RMA	Rubber Manufacturers Association www.rma.org	(800) 220-7620 (202) 682-4800
54.	SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
55.	SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
56.	SIGMA	Sealed Insulating Glass Manufacturers Association www.sigmaonline.org/sigma	(312) 644-6610
57.	SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995

58.	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
59.	SSMA	Steel Stud Manufacturers Association www.ssma.com	(312) 456-5590
60.	SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(800) 837-8303 (412) 281-2331
61.	SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
62.	TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
63.	TIA/EIA	Telecommunications Industry Association / Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
64.	UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800
65.	WDMA	Window & Door Manufacturers Association www.wdma.com	(800) 223-2301 (847) 299-5200
66.	WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1.	BOCA	BOCA International, Inc. ww.bocai.org	(708) 799-2300
2.	CABO	Council of American Building Officials	(See ICC)
3.	IAPMO	International Association of Plumbing and Mechanical Officials ww.iapmo.org	(909) 595-8449
4.	ICBO	International Conference of Building Officials ww.icbo.org	(800) 284-4406 (562) 699-0541
5.	ICC	International Code Council ww.intlcode.org	(703) 931-4533

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are

subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1.	CPSC	Consumer Product Safety Commission ww.cpsc.gov	(800) 638-2772 (301) 504-0990
2.	DOC	Department of Commerce ww.doc.gov	(202) 482-2000
3.	EPA	Environmental Protection Agency ww.epa.gov	(202) 260-2090
4.	FCC	Federal Communications Commission ww.fcc.gov	(202) 418-0190
5.	FDA	Food and Drug Administration ww.fda.gov	(888) 463-6332
6.	GSA	General Services Administration ww.gsa.gov	(202) 708-5082
7.	HUD	Department of Housing and Urban Development ww.hud.gov	(202) 708-1112
8.	NIST	National Institute of Standards and Technology ww.nist.gov	(301) 975-6478
9.	OSHA	Occupational Safety & Health Administration ww.osha.gov	(202) 693-1999

D. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

NSYDOL	New York State Department of Labor
9NYCRR	New York State Uniform Fire Prevention and Building Code

Generally Accepted Standards, Part 1250 Subchapter G, Codes, Rules and Regulations, Department of State

New York State Energy Conservation Construction Code – 2020 Stretch Code

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 014200

SECTION 01 45 00

SPECIAL INSPECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes: Requirements for Special Inspections. The Owner shall employ one Special Inspection Manager and one or more Special Inspectors to provide inspections during construction.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the contract Documents requirements.

Requirements for the contractor to provide quality-control services required by Architect or Authorities having jurisdiction are not limited by provisions of this section.

C. The Owner will retained the services of an inspection company for onsite review of subsurface conditions, suitability of soils, coordination and review of testing requirements for the utilities, site parking area and building pad.

1.2 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved. The inspecting agency shall maintain a current certificate of accreditation, by an independent recognized national standards organization, for the test(s) that will be performed by said agency. Approved agency(s) will be required to submit resumes of all employees working on the project.

Independent: An approved agency shall be objective and competent. The agency shall also disclose possible conflicts of interest so that objectivity can be confirmed.

Equipment: An approved agency shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated.

Personnel: An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests and/or inspections.

B. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved Special Inspector who is present in the area where the work is being performed.

C. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved Special Inspector who is present in the area where the work has been or is being performed and at the completion of the work.

D. Quality-Assurance Services: Activities, actions and procedures performed before and during execution of the work to guard against defects and deficiencies and ensures that proposed construction complies with requirements.

E. Special Inspection Manager: Special Inspection Manager collects, Review for completeness and distributes special inspection reports to the Code Enforcement Official and the Engineer/Architect of record. The Special Inspection Manager shall schedule and coordinate work of the Special Inspectors with the contractors.

F. Code Enforcement Official: Authority Having Jurisdiction

1.3 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of the following regulations and retain at the project site to be available for reference by parties who have a reasonable need:

Building Code of New York State, Chapter 17 "Structural Tests and Special Inspections". By New York State Department of State, 41 State Street, Albany, New York.

B. Building permit requirement: The permit applicant shall submit a statement of special inspections prepared by the registered design professional in responsible charge as a condition for permit issuance.

1.4 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI International (ACI)

a. ACI 318/318R (1995) Building Code Requirements for Structural Concrete and Commentary

b. ACI 318M (1995) Metric Building Code Requirements for Structural Concrete and Commentary

c. ACI 530/530.1 (1995) Building Code Requirements for Masonry Structures American Institute of Steel Construction (AISC)

d. AISC 341 (1997) Seismic Provisions for Structural Steel Building

e. AISC 350 (1993) Load and Resistance Factor Design Specification for Structural Steel Buildings

f. American Society for Testing and Materials (ASTM)

g. ASTM A 435/A 435M (1990) Straight-Beam Ultrasonic Examination of Steel Plates

h. ASTM A 615/A 615M (1996a) Deformed and Plain Billet-steel Bars for Concrete Reinforcement

i. ASTM A 898/A 898M (1991) Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

B. Special Inspector: Provide a Special Inspector at the work site for each of the areas of responsibilities, specified below, who shall assist and report to the Special Inspection Manager, Owner, Engineer/Architect of record and who shall have no duties other than their assigned quality control duties. Special Inspectors are required to be physically present at the construction site to perform the phases of control and prepare documentation for each definable feature of work in their area of responsibility at the frequency specified. Special Inspectors shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

Requirement for Special Inspectors shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

Concrete:

a. 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.

b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I.

c. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

Smoke Control Systems:

a. Personnel conducting field tests shall be qualified in fire protection engineering, mechanical engineering, and certification as air balancer certified by AABC Test and Balance Technician.

b. Structural Steel: Registered Structural Engineer, (P.E.) in New York State with a minimum of 5-years experience.

Welding

a. Personnel conducting field tests shall be qualified as Certified Welding Inspector (CWI) according to AWS QC1 or an equivalent certification program.

1.6 SPECIAL INSPECTIONS

A. Inspection of fabricators. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, special inspection of the fabricated items shall be required by this section and as required elsewhere in the code.

B. Steel construction. The special inspections for steel elements of buildings and structures shall be as required by Section 1704.3 and Table 1704.3 of The New York State Building Code. Where required special inspection of steel shall also comply with Section 1715 of The Building Code of New York State.

C. Concrete construction. The special inspections and verifications for concrete construction shall be as required by this Section 1704.4 and Table 1704.4 of The Building Code of New York State.

D. Masonry construction. Masonry construction shall be inspected and evaluated in accordance with the requirements of The Building Code of New York State, depending on the classification of the building or structure or nature of occupancy, as defined by the Building Code of New York State (see Table 1604.5 and Table 1617.6 of The Building Code of New York State).

E. Wood construction. Special inspections of the fabrication process of wood structural elements and assemblies shall be in accordance with Section 1704.2. of The Building Code of New York State

F. Soils. The special inspections for existing site soil conditions fill placement and load-bearing requirements shall follow Section 1704.7.1 through 1704.7.3 of The Building Code of New York State. The approved soils report, required by Section 1802.2 of The Building Code of New York State, shall be used to determine compliance.

G. Pile foundations. A special inspector shall be present when pile foundations are being installed and during tests. The special inspector shall make and submit to the code enforcement official records of the installation of each pile and results of load tests. Records shall include the cutoff and tip elevation of each pile relative to a permanent reference.

H. Pier foundations. Special inspection is required for pier foundations for buildings assigned to Seismic Design Category C, D, E or F in accordance with Section 1616.3 of The Building Code of New York State.

I. Wall panels and veneers. Special inspection is required for exterior and interior architectural wall panels and the anchoring of veneers for buildings assigned to Seismic Design Category E or F in accordance with Section 1616.3 of The Building Code of New York State. Special inspection of such masonry veneer shall be in accordance with Section 1704.5 of The Building Code of New York State.

J. Sprayed fire-resistant materials. Special inspections for sprayed fire-resistant materials applied to structural elements and decks shall be in accordance with Sections 1704.11.1 through 1704.11.5 of The Building Code of New York State. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents.

K. Exterior insulation and finish systems (EIFS). Special inspections shall be required for all EIFS applications.

L. Special cases. Special inspections shall be required for proposed work that is, in the opinion of the code enforcement official, unusual in its nature, such as, but not limited to, the following examples:

Construction materials and systems that are alternatives to materials and systems prescribed by this code.

Unusual design applications of materials described in this code.

Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

M. Smoke Control systems. Smoke control systems shall be tested by a special inspector.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 STATEMENT OF SPECIAL INSPECTIONS

A. Refer to attached form **"Statement of Special Inspections"** at the end of this section.

B. Refer to Sheet S-002 in the Drawing Set for the list of required Special Inspections.

3.2 SPECIAL INSPECTION REPORTS

A. Report requirement: Special Inspectors shall keep records of inspections. The Special Inspector shall furnish inspection reports to the Special Inspection Manager. The Special Inspection Manager shall furnish reports to the Code Enforcement official, Owner, and to the Engineer/Architect in responsible charge.

Reports shall indicate that work inspected was done in conformance to approved construction documents.

Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Code Enforcement Official and to the Engineer/Architect in responsible charge prior to the completion of that phase of the work.

B. Periodic Report: On the first day of each month, the Special Inspector shall furnish to the Special Inspection Manager five copies of the combined progress reports of the special inspector's observations. The Special Inspection Manager shall furnish five reviewed copies to the Code Enforcement Official and to the Engineer/Architect of responsible charge. These progress reports shall list all special inspections of construction or reviews of testing performed during that month, note all uncorrected deficiencies, and describe the corrections made both to these deficiencies and to previously reported deficiencies.

Each monthly report shall be signed by all special inspectors who performed special inspections of construction or reviewed testing during that month, regardless of whether they reported any deficiencies.

Each monthly report shall be signed by the Contractor.

C. Final Report: At completion of construction, each Special Inspector shall prepare and sign a final report attesting that all work they inspected and all testing and test reports they reviewed were completed in accordance with the approved construction documents and that deficiencies identified were satisfactorily corrected.

The Special Inspector shall submit a combined final report containing the signed final reports to the Special inspection manager.

The Special Inspection Manager shall submit the combined final report to the Code Enforcement Official, Owner, and to the Engineer/Architect in responsible charge.

The Contractors shall sign the combined final report attesting that all final reports of Special Inspectors that performed work to comply with these construction documents are contained therein, and that the Contractor has reviewed and approved all of the individual inspector's final reports.

Refer to attached form **"Report of Special Inspections"** attached at the end of this section.

SPECIAL INSPECTIONS REPORT FORM

REPORT TYPE:

☐ Continuous

☐ Periodic

☐ Final

WORK / MATERIAL INSPECTED:

PROJECT NAME:

Address or Legal Description:

Owner's Name:

Phone:

Fax:

APPROVED INSPECTION AGENCY:

Address:

Phone:

Fax:

AUTHORITY HAVING JURISDICTION:

Address:

Phone:

Fax:

ENGINEER/ARCHITECT OR RECORD:

Address:

Phone:

Fax:

STATEMENT OF CONFORMANCE:

Discrepancies:

1. None _____
    a. Contractor Review:
    b. Contractor signature:
    c. Contractor correction:

Outstanding Discrepancies:

1. None _____
    a. Authority Having Jurisdiction review:
    b. Registered Design Professional review:

END OF FORM

END OF SECTION 014500

SECTION 01 50 00

TEMPORARY FACILITIES & CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Portable Chemical Toilet Facilities.
2. Dumpsters.
3. Temporary Electric Power.
4. Temporary Lighting.
5. Water service and distribution.
6. Temporary heat.
7. Temporary Barricades.
8. Temporary Storm Drainage.
9. Temporary Staging Area, Access Roads, Site Signage, and Site Fence
10. Building and Site Maintenance
11. Temporary Fire Extinguishers and Signage for Building Construction:

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Architects/Engineers field office.
3. Telecommunication service.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Hoists and temporary elevator use.
7. Rodent and pest control.
8. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Tree and plant protection.
3. Pest control.
4. Security enclosure and lockup.

1.2 DIVISION OF RESPONSIBILITIES

A. General: Each prime contractor is specifically assigned certain responsibilities for temporary services and facilities to be used by other prime contractors, and other nonprime contractors and separate entities at the site, Owner’s workforces, Construction Manager, Architect, testing agencies, personnel of governing authorities, and personnel authorized to be at project site during contract time.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. The Architect will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.

B. Water Service: Use water from the Owner's existing water system (when available) without metering and without payment of use charges. Access to water shall be designated by the Owner. If existing water supply system is not available, then provide water tanks as required and fill with potable water to supply the Temporary Water Distribution System.

C. Electric Power Service:

1. Use of electric power from the Owner's permanent power system (when available) will be granted to all prime contractors without payment of use charges.

1.4 SUBMITTALS

A. Temporary Utilities: The prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, each prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.

C. Temporary Signage: Provide shop drawings, indicating the size and layout of the signs, color choices for Owner selection and installation details.

D. Submit Product Data and Shop Drawings of Proposed Temporary Facilities.

1.5 QUALITY ASSURANCE

A. Regulations: The prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department and rescue squad rules.
5. Environmental protection regulations.

B. Standards: The prime contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Local custom and trade union jurisdictional settlements do not control the scope of work included in each prime contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: The prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: The Installer of each permanent service shall assume responsibility for its operation, maintenance, and protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: The prime contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Lumber and Plywood:

1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.

2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated.

3. For fences and vision barriers, provide minimum 3/8-inch- thick exterior plywood.

4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.

C. Insulation: Unfaced mineral-fiber blanket manufactured from glass, slag wool, or rock wool; with maximum flame spread and smoke developed indices of 25 and 50, respectively.

D. Gypsum Wallboard: Provide gypsum Type X wallboard on interior walls of temporary barricades or partitions.

E. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.

F. Paint: Comply with requirements of Division 9 Section "Painting."

1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.

3. For interior walls, provide 2 coats interior latex-eggshell wall paint.

G. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

H. Water: Provide potable water approved by local health authorities.

I. Open-Mesh Fencing: Provide 0.12-inch- thick, galvanized 2-inch chain-link fabric fencing 8 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

A. General: The prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Lamps and Light Fixtures: Provide service lamps of wattage required for adequate illumination per OSHA requirements. Provide guard cages or tempered-glass enclosures, when exposed to breakage. Provide lamps suitable for exterior conditions when lamps are exposed to exterior conditions or moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

1. The use of indirect fired source heaters (Heat source placed outside the building, ducted into the building) shall be the primary source of temporary heat.

2. Use of gasoline-burning space heaters, direct fire, open flame, or salamander-type heating units is prohibited. Temporary heating sources utilizing electric power as energy source, shall not be used on this project.

G. Temporary Offices: Each contractor shall provide its own prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES RESPONSIBILITIES - DESIGNATED IN 011200 MULTIPLE CONTRACT SUMMARY.

See 011200 – Multiple Contract Summary for designated Contractor responsibility of temporary facilities indicated below.

1. Temporary Portable Chemical Toilet Facilities

a. Temporary Portable Chemical Toilet Facilities shall comply with regulations, CDC guidelines, and health codes for type, location, operation, and maintenance of fixtures and facilities.

b. Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.

c. Provide Portable Toilet Facility at Staging area and areas near building.

d. Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.

e. Provide toilet tissue, paper towels, paper cups, hand sanitizer, and similar disposable materials for each facility. Provide covered waste containers for used material.

f. Provide separate facilities for male and female personnel.

g. Provide portable handwash sink(s) with soap dispensers and paper towels.

h. Provide at minimum (1) portable handwash sink at staging area.

i. Install Portable Toilets and Portable Sinks. where facilities will best serve the Project's needs.

j. Replenish consumable materials as utilized. Provide cleaning of facilities when required.

k. Contractors are to not use owner's existing restrooms or facilities.

2. Dumpsters:

a. Dumpsters are to be provided as needed to dispose of all materials needing to be removed from the building/site and waste materials associated with the new building/site work indicated on milestone schedule or when complete with their own work (whichever occurs later).

b. Dispose of materials lawfully.

c. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials will be by the contractor designated responsible for removing the hazardous waste.

d. Surfaces/Pavement below dumpsters are to be protected and restored.

3. Temporary Electric Power Service:

a. **Temporary Electric Power Service** shall consist of main power hook-up and panel board for the new building and site. Temporary service shall be maintained during all workdays and shall comply with all codes and regulations. System shall be modified as required or as directed by the Construction Manager as work progresses.

b. Obtain temporary service from existing building service or local power pole. If practical, power to each location shall be tapped at transformer vault or main distribution panel, ahead of main breakers to minimize demand on service equipment from operations. Over-current protection shall be installed as required. Provide disconnect at connection to service.

c. The Contractor shall pay all fees to Utility Company for Temporary Electric Power Service Connection when an existing Power Source is not indicated to already be available for connection in the Contract Documents.

d. Minimum power characteristics: 240/120-volt, single phase.

e. Provide distribution equipment, feeders, and branch circuit panelboards to serve:

1) **Temporary Lighting Service**.

2) Temporary convenience receptacles.

a) Quad 120V Outlet boxes to allow for 25' extension cord with walls in place; enough to accommodate requirements of the entire building.

3) To accommodate construction operations requiring power, use of power tools, and start up testing of permanent electric powered equipment prior to its permanent connection to electrical system.

b) Each Contractor shall provide his own extension lines, and other special equipment. Welding equipment shall run from generator trucks. Any specialty high voltage/amperage power required beyond what's provided

by under the Temporary Electric Power Service is to be provided by the contractor requiring the specialty power.

c) The Contractor shall be responsible for initial connections and final demolition of all temporary fixtures and wiring at direction of the Construction Manager.

d) Unless indicated on Staging and Logistics plan, each Contractor will be responsible for hookup of their own project trailers by a licensed electrician to existing service or temporary electric panel provided per Staging Area and Logistics Plan if indicated or for Contractor Trailer Power. The Contractor shall erect poles safely and sufficient for site power and telephone service. The Contractor shall disconnect all items and restore damaged areas upon project completion. If abused, power from temporary service will be disconnected.

4. **Temporary Lighting Service**:

a) When an overhead floor or roof deck has been installed obstructing daylight from overhead, the Contractor shall provide temporary lighting with local switching suitable for exterior weather conditions within the building under the roof deck prior to building weathertight roof enclosure.

b) Temporary lighting shall be maintained in accordance with OSHA standards for power and foot candle levels in all areas, rooms, and corridors while workers occupy the space. Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.

c) Additional lighting beyond OSHA standards for specialty work is to be provided by **each contractor** performing specialty work requiring the additional lighting.

d) As ceilings are installed, the Contractor is to move temporary lights as needed to maintain lighting in all work areas during working hours.

e) Security lighting for building exteriors shall be continuously operational and maintained. The Contractor shall provide a minimum of six (6) exterior temporary site lights at 10,000 Lumen each, ***ON SITE TO BE LOCATED by CM.***

f) Temporary Site Lighting: The Contractor is to maintain existing exterior lighting to adequately light the entrances and exits of project site.

g) Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.

5. **Temporary Water Service**:

a) If existing water service is available by Owner, the Contractor shall provide and maintain temporary water service from Owner existing water source.

b) If existing water service is not available, then the Contractor designated as responsible for the Temporary Water service shall supply potable water tank(s). The Contractor shall refill water tank(s) with potable water as other contractors utilize the supplied water until final water service is installed.

c) Provide distribution piping of sizes and pressures adequate for construction and hose bibs on site as to provide service to all areas of construction activities as required throughout the construction period. (Allow for 50′ water extension hose to work areas.)

d) **Each Contractor** shall provide temporary water as needed for their own work until Temporary Water Service is installed.

e) Water service shall be potable and modified as required or as directed by the Construction Manager as work progresses.

f) Sterilization: Sterilize temporary water piping.

g) Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly.

6. **Temporary Heating Service:**

a) Upon enclosure of the new building(s) and addition(s) (by either temporary barriers or permanent wall systems) or as indicated by the milestone schedule, whichever is sooner, the Contractor shall provide **Temporary Heating Service**: equipment, heaters, duct, and all fuel necessary to continue construction work and maintain proper heated conditions in the buildings at a minimum temperature of 50°F.

1) The use of <u>indirect fired source heaters</u> (Heat source placed outside the building, ducted into the building) shall be the primary source of temporary heat. The contractor shall provide duct from the heaters into the various areas of the building. In no case shall temperature in the building be less than 50°F.

2) Substitutions of Temporary Heating Method may be proposed and reviewed at the discretion of the Construction Manager/Architect.

3) Use of gasoline-burning space heaters, direct fire, open flame, or salamander-type heating units is prohibited. Temporary heating sources utilizing electric power as energy source, shall not be used on this project.

b) Temporary Heating for Isolated work area: Each prime contractor shall provide temporary heating or dehumidification as required by construction activities for curing or drying of completed installations or for protecting stored materials or installed construction within building from adverse effects of low temperatures above the 50°F minimum temperature or high humidity.

c) Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize energy consumption.

d) The Contractor(s) shall provide manpower for maintenance, operation, and supervision for Temporary Heating Service, multiple shifts as applicable.

e) The Owner will not accept utilization of permanent HVAC system for temporary heat until spaces served by HVAC system have received final cleaning and project acceptance.

7. **Temporary Barricades and Building Signage:**

a) Provide Temporary lockable entrances / doorways and exits to the building, which is to be furnished, installed, and maintained.

1) Exits shall be maintained for exiting in emergency conditions which include doors with lockable panic hardware and closers until permanent structures are in place. Maintain Doorways throughout construction to ensure all hardware functions, and closers automatically close doors.

2) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.

3) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.

b) Provide Temporary Interior/Exterior Partitions, which shall be at minimum fire rated 1-hour constructed of: metal stud framing, acoustic insulation, sealant.

1) For interior partitions utilize painted gypsum. For Exterior Partitions, utilize painted 5/8″ Fire Retardant Plywood.

1). Provide sealant of all seams to prevent migration of dust.

2) Adjust and Reinstall Ceiling as required at Temporary Partitions for a finished appearance from the occupied side of partition.

3) Temporary interior partitions and interior doorways shall be provided to separate construction areas from occupied areas.

c) The Construction Manager may direct the **General Contractor** to install and maintain Temporary Plastic Sheeting Partitions as needed to separate the construction areas from the occupied areas at no additional cost.

d) Additional Temporary Barricades may be required due to delay of substantial completion for owner's use of section(s) of building(s) and are to be provided contractor responsible for the delay.

e) The Contractor shall provide and maintain OSHA Minimum perimeter and stairwell barricades/railings at grade changes, multiple levels, and floor/roof openings.

1) Provide Top & Mid railings, and Toe boards per OSHA requirements.

2) Install posts as required to support railings.

3) Provide fluorescent ribbons to accent floor/roof openings.

4) If a Contractor should need to temporarily relocate barrier, same Contractor shall protect personnel in the area and replace barrier to original location.

f) Temporary infill/coverings for openings are to be provided by the Contractor that created the opening. Temporary opening infills/coverings are to meet structural requirements per OSHA guidelines.

g) Provide Temporary Emergency Exit Signage within the new building to direct personnel to nearest emergency exits. Provide at all exits, stairwells, and areas where exit signs cannot be seen.

h) Provide Project Identification Signage at Building Entrance (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)

i) Restore all surfaces after removal of Temporary Barricades.

8. **Temporary Building Storm Drainage:**

a. Temporary Building Storm Drainage shall consist of Temporary drainage piping from Roof Drains to sufficient distance from of building as required to not disturb ongoing construction until final roof drain piping is installed, and final drainage utility system is completed.

b. Adjust Drainage Piping as directed by Construction Manager.

9. **Temporary Staging Area, Access Roads, Site Signage, and Site Fence:**

a. The Contractor shall provide construction of the temporary staging area, access roads, stabilized construction entrances, temporary site signage, and temporary construction fence as indicated on the Staging and Logistics Plans.

b. Maintain and restore staging area and access roads that are disturbed throughout construction.

c. Remove all temporary materials and restore all areas at completion of project.

d. The Contractor responsible for Site Work (Site Contractor) shall maintain access roads for suitable parking areas as indicated on Site Logistics plans.

1) Re-grade, re-seed and restore any areas disturbed by parking/staging.

2) Parking Areas: Includes contractors' employees and construction vehicle parking. Minimum of 6" reference Item. #304.3 course installed over geotextile fabric.

3) Temporary parking by construction personnel shall be allowed only in areas designated.

e. Access Roads: Includes access roads for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Minimum of 9" reference Item. #304.3 course installed over geotextile fabric.

1) Stabilized Construction entrances: Minimum 6" Thick, 50FT Length x 24' Width, 2" Stone over geotextile fabric/filter cloth. Extend width of entrance to 32' width where entrance meets existing pavement to allow turning radius of vehicles pathway.

2) Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. 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 the temporary entrances, as required by the governing authority.

f. Construction Fence: Provide Construction fence with lockable entrance gates. Locate where indicated or enclose the entire site or the portion determined sufficient to accommodate construction operations or as indicated on Staging Area and Logistics Plan. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1) Provide at Construction Fence: open-mesh, 8-foot-high chain-link fencing with posts at 8-feet on center, set in a compacted mixture of gravel and earth.

a) Provide movable fence panels with sandbags and fence clamps to prevent tampering with fence when required in areas that require adjustment during construction as approved by Construction Manager.

2) Provide maintenance of Temporary Construction Fence as disturbed throughout construction to ensure site and staging area security is maintained and all gates remain operational.

3) Provide minimum of (1) 4' man gate, and (3) 20' hinged double swing access gates. Each gate is to have a chain and padlock. Adjust gate hinges to prevent gating from dragging on surface.

4) Provide keys for each lock to the Construction Manager, Owner, and each Contractor.

g. Temporary Site Signage: The Contractor shall provide all temporary Construction Signage, temporary traffic controls at junction of temporary roads with public roads.

1) Engage an experienced sign painter to apply graphics. Comply with details indicated.

2) Include warning signs for public traffic and "STOP" signs for entrance onto public roads.

3) Comply with requirements of authorities having jurisdiction.

4) Engage an experienced sign painter to provide the following signs to be installed by the Contractor in compliance with signage requirements (install all directional signage at all intersections):

a) To direct visitors (as required to reach visitor area)

b) For construction parking (as required to reach parking area)

c) To direct deliveries (as required to reach material delivery area) (List each Contractor)

d) "Construction Site – Authorized Personnel Only" (Perimeter of Construction Fence 40' Intervals)

e) Project Identification Signage at Entrance of Site (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)

10. **Building & Site Maintenance:**

a. <u>Maintaining Temporary Access Roads and Existing Roads</u>:

1) Maintain and restore roads over the period of construction.

2) Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily.

3) If required, provide a minimum of once-a-week road cleaning for debris/dust accumulated.

a) Road cleaning equipment to be wet/vacuum type. Contractor will clean the roads affected by all contract work. The Contractor will maintain roads until project completion.

4) Snow Plowing: Provide snow/ice removal to building entrances, temporary access roads, parking areas, staging area, portable toilets, and a 5′ walkway to all office trailers.

b. Snow/Ice Removal at Building/Adjacent Sidewalks:

1) Provide snow/ice removal at sidewalk areas and entrances adjacent to building, ice/snow removal inside the building areas, and roofing areas for scheduled work.

2) Protect areas from snow/ice removal and restore any surfaces damaged.

11. **Temporary Fire Extinguishers for Building Construction:**

a. The Contractor shall provide, until fire-protection needs are supplied by permanent facilities, install, and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1) Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2) Store combustible materials in containers in fire-safe locations outside of buildings.

3) Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.

3.2 TEMPORARY TELECOMMUNICATIONS SYSTEMS (To be Provided by All Contractors)

A. General: Engage the appropriate local telecommunication, internet service provider, or utility company to install temporary telecommunication service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials, and equipment. Comply with company recommendations.

B. Temporary Telephones: Each Prime Contractor shall provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.

1. Contractors are required to lease or purchase a cellular telephone – to be used by their site superintendents for communication with the other primes and the Architect.

3.3 TEMPORARY FACILITIES INSTALLATION (To be Provided by All Contractors)

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. The prime contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.4 SUPPORT FACILITIES INSTALLATION (To be Provided by All Contractors)

A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access as directed by the Construction Manager.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 50 feet of building. Comply with requirements of NFPA 241.

C. Field Offices: Each prime contractor shall provide an insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small meetings. Furnish and equip offices as follows:

1. Furniture: Furnish with a desk and chairs, a 2-drawer file cabinet, plan table, plan rack, and a bookcase.

D. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site. Flammable liquids are not to be stored in building at any time and to be stored in proper rated containers.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION (To be Provided by All Contractors)

A. Operations of the Contractor may not block, hinder, impede, or otherwise inhibit the safe and expeditious exiting of the building's occupants during an emergency.

B. In the event of an emergency, (designated by the sounding of the fire alarm system) all construction activities must immediately cease. Contractor's work force will evacuate themselves from work areas and remain outside of work areas until the "all clear" is given. No work operations will be tolerated during the evacuation of the building or during an emergency.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

D. Building Security Enclosure and Lockup: Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid using tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.6 OPERATION, TERMINATION, AND REMOVAL (To be Provided by All Contractors)

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities and good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

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.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Construction Manager requests that it be maintained longer, remove each temporary facility when the need has ended, when 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 the 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 the property of each prime contractor. The Owner reserves the right to take possession of project identification signs.

END OF SECTION 015000

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding period and accepted by Addendum prior to award of the Contract.

2. Specified options for products and construction methods included in the Contract Documents.

3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents to extend time limit provided, either by manufacturer's warranty or to provide more rights for Owner.

1.3 SUBMITTALS

A. Submittals shall comply with the requirements of the Construction Contract Clauses, Division 1 section "SUBMITTAL PROCEDURES" and the individual sections specifying the work.

B. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.

b. Generic name used in the Contract Documents.

c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.

e. Supplier's name and address.

f. Installer's name and address.

g. Projected delivery date or time span of delivery period.

h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within fifteen (15) workdays after date of commencement of the Work, submit one electronic copy of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within thirty (30) workdays after date of commencement of the Work, submit one electronic copy of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.

5. Architect's Action: Architect will respond in writing to Contractor within 10 workdays of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

C. Substitution Requests: Refer to Section 012500 'Substitution Procedures'

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source. Equipment of the same function shall be manufactured by the same entity, unless otherwise indicated.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Labels and nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate nameplate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information:

a. Name of product manufacturer.

b. Model and serial numbers.

c. Operating data such as capacity, speed and ratings.

3. Protection: Labels and nameplates shall be protected from defacement and other damage during the remainder of the Work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products to allow for inspection and measurement of quantity or counting of units.

6. Store materials in a manner that will not endanger Project structure.

7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT COMPLIANCE AND REQUIREMENTS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Where products are accompanied by the term "as selected," Architect will make selection.

4. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

B. Product Selection Procedures: The Contract Documents, including the Construction Contract Clauses, govern product selection. Requirements for product selection include the following:

1. Where the Specifications lists manufacturers' names or product designations, the Contractor may provide any product that complies with the requirements, subject to the following conditions:

a. Manufacturers: Where a Specification paragraph or subparagraph titled "Manufacturers" lists manufacturers' names, provide a compliant product by one of the manufacturers named, or request a Substitution of another compliant product by another manufacturer.

b. Products: Where a Specification paragraph or subparagraph titled "Products" lists product designations, provide one of the products designated, or request a Substitution of another compliant product.

c. Basis of Design: Where a Specification paragraph or subparagraph titled "Basis of Design" includes a product designation, provide the product designated, or an equivalent product by another manufacturer.

2. Descriptive Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

3. Performance Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

4. Prescriptive Requirements: Where Specifications require products that are produced using specified ingredients and components, including specific requirements for mixing, fabricating, curing, finishing, testing and similar operations in the manufacturing process, provide products produced in accordance with the prescriptive requirements that otherwise comply with Contract requirements.

5. Codes, Standards and Regulations: Where Specifications require compliance with an imposed code, standard or regulation, select a product that complies with the codes, standards or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, the Contracting Officer's Representative's decision will be final on whether a proposed product matches satisfactorily. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions concerning "substitutions" for selections of a matching product in another product category.

7. Visual Selection: Where specified product requirements include the phrase "as selected from manufacturer's standard colors, patterns, textures" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Contracting Officer's Representative will select the color, pattern and texture from the manufacturer's product line.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within the bid period. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities

Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. The request is timely, fully documented, and properly submitted.

5. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that, the substitution will overcome the incompatibility.

7. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.

8. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

9. Requested substitution has received necessary approvals of authorities having jurisdiction.

10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance,

weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 01 70 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.2 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor.

E. Final Property Survey: Submit 5 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Contact private utility companies to determine location of electric and telephone.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.

b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.

d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: The Site Work Contractor (Contract #1) and General Work Contractor (Contract #2) shall engage a land surveyor to lay out their respective Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

D. Remove liquid spills promptly.

E. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

F. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

G. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

H. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

I. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

J. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

K. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

L. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

M. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017000

SECTION 01 73 10

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work, including, but not limited to; cutting, drilling, chopping, and other similar operations.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work, including, but not limited to; patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, an other similar operations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction

b. Bearing and retaining walls

c. Structural concrete

d. Structural steel

e. Lintels

f. Timber and primary wood framing

g. Structural decking

h. Stair systems

i. Miscellaneous structural metals

j. Exterior curtain-wall construction

k. Equipment supports

l. Piping, ductwork, vessels, and equipment

m. Structural systems of special construction in Division 13 Sections.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment

b. Air or smoke barriers

c. Water, moisture, or vapor barriers

d. Membranes and flashings

e. Fire protection systems

f. Noise and vibration control elements and systems

g. Control systems

h. Communication systems

i. Conveying systems

j. Electrical wiring systems

k. Operating systems of special construction in Division 23 Sections

C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

3. Equipment supports.

4. Piping, ductwork, vessels, and equipment.

5. Noise- and vibration-control elements and systems.

1.5 WARRANTY – Not applicable for Existing Warrantees

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017310

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 01 73 20

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected site elements.

2. Repair procedures for selective demolition operations.

3. Demolition and removal coordination with/for asbestos abatement.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner or Construction Manager ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property or become Construction Manager’s property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame

for their operation. Identify options if proposed measures are later determined to be inadequate.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

E. Predemolition Photographs or Videotape: Show existing conditions of site improvements that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.6 PROJECT CONDITIONS

A. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Hazardous Materials: Hazardous materials are present on site to be selectively removed. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

C. Storage or sale of removed items or materials on-site will not be permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES - NOT APPLICABLE

3.3 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.

C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, 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 governing regulations.

2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

3. Protect existing site improvements, appurtenances, and landscaping to remain.

4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

5. Coordinate any work within the NYS Rte. 44 highway bounds with requirements stipulated in the NYSDOT Highway Work Permit.

D. Temporary Enclosures: Provide temporary enclosures for protection of existing building and 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, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

E. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

4. Maintain adequate ventilation when using cutting torches.

5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

6. Dispose of demolished items and materials promptly.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 1 Section "Cutting and Patching."

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials and dispose of at designated spoil areas off site.

END OF SECTION 017320

SECTION 01 77 00

CLOSEOUT PROCEDURES

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

b. If 100 percent completion cannot be shown, prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

1. Advise Owner of pending insurance changeover requirements.
2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.2 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section entitled "PAYMENT PROCEDURES."
   a. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit pest-control final inspection report and warranty.
7. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.3 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project Name
      b. Date
      c. Name of Architect
      d. Name of Contractor
      e. Page Number

1.4 PROJECT RECORD DOCUMENTS

Delete this Article if Project uses Division 1 Section "Project Record Documents."

AIA Document A201 includes general provisions for Project Record Documents. This Article expands on those requirements.

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one electronic copy of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity that obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
      d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
   2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
   3. Mark important additional information that was either shown schematically or omitted from original Drawings.
   4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one electronic copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, Record Drawings, and Product Data, where applicable.

D. Record Product Data: Submit one electronic copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the owner's Sample storage area.

F. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.3 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.

b. System, subsystem, and equipment descriptions, including operating standards.

c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

d. Description of controls and sequence of operations.

e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.

b. Name, address, and telephone number of Installer or supplier.

c. Maintenance procedures.

d. Maintenance and service schedules for preventive and routine maintenance.

e. Maintenance record forms.

f. Sources of spare parts and maintenance materials.

g. Copies of maintenance service agreements.

h. Copies of warranties and bonds.

i. Wiring Diagrams

j. Fixture lamping schedule

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.5 WARRANTIES

A. Submittal Time: Submit electronic written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

On advice of Owner's legal counsel, revise paragraph below to suit Project. Sometimes, extended warranties may be necessary.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

Revise first subparagraph below to suit Project.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

Coordinate below if Division 1 Section "Operation and Maintenance Data" is used.

PART 2 - PRODUCTS

2.1 MATERIALS

Below contains basic requirements. Revise requirements to suit Project or to accommodate unusual situations.

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

Delete this Article if using Division 1 Section "Demonstration and Training." Paragraphs and subparagraphs below contain minimum requirements.

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

If specific instructors, e.g., Installer or a factory-authorized service representative, are required for demonstration, indicate the requirement in individual Specification Sections.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.

6. Maintenance / Maintenance agreements and similar continuing commitments
7. Repair.
8. Spare Parts and Materials
9. Tools
10. Lubricants
11. Fuels
12. Identification Systems
13. Control Sequences
14. Hazards
15. Cleaning

C. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

D. Record "As-Built" Drawings

1. Upon completion of the Work, and review of the record drawings by the Architect, prepare a final set of record drawings in electronic format. Submit final set PDF's to Construction Manager and Architect.
2. The cost of furnishing electronic documents and preparing these record drawings shall be included in the Contract price.

E. Provide operating and maintenance instruction to Owner's personnel for following systems and equipment, with minimum instruction periods, comprised of approximately 50% classroom instruction and 50% "hands on" instruction as follows:

Systems and Equipment		Training Time Hour(s)
1. Site Work Contract		
a.	Bio Retention Maintenance	2
2. General Construction Work Contract		
a.	Electrified door hardware	2
b.	Elevator	4
c.	Miscellaneous General Construction items (not included above)	4
d.	Store front maintenance	1
3. Plumbing Work Contract		
a.	Plumbing domestic hot and cold water systems	1
b.	Sanitary Systems	1
c.	Plumbing Fixtures and specialties	2

d. Miscellaneous plumbing items 2

4. HVAC Work Contract
   a. Fans 1
   b. Cabinet heaters 1
   c. Condensing units 1
   d. VRF System 2
   e. Balancing 4
   f. Temperature Controls 24
   g. Terminal units 2
   h. Miscellaneous HVAC items (not included above) 4

5. Electrical Work Contract
   a. Fire Alarm system 8
   b. Lighting Control Equipment 4
   c. Security 8
   d. Miscellaneous electrical items (wiring devices, fuses, panelboards, interior lighting, disconnect switches, circuit breakers) 2

6. Videotape, electronic format, hands-on training sessions and classroom instruction periods, specified in this Specification. No special effects required.

3.2 FINAL CLEANING

Delete this Article if owners prefer to use their own forces. Cleaning provisions in the General Conditions are limited to rubbish removal and similar activities.

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. If final cleaning is delayed until final acceptance, revise subparagraph below.

   2. The Site Work Contractor (Contract #1) shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Remove snow and ice to provide safe access to building.

   3. The General Work Contractor (Contract #2) shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean roof areas of debris and foreign matter.

b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
c. Sweep concrete floors broom clean in unoccupied spaces.
d. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
f. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
g. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
h. Clean windows, inside and outside including frames at project completion
i. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
j. Remove tools, construction equipment, machinery, and surplus material from Project site.
k. Leave Project clean and ready for occupancy.

4. The Plumbing Work Contractor (Contract #3) shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Wipe surfaces of plumbing equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    b. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    c. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Leave Project clean and ready for occupancy.

5. The HVAC Work Contractor (Contract #4) shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Wipe surfaces of mechanical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    b. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

c. Clean ducts, blowers, and coils if units were operated without filters during construction.
d. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
e. Remove tools, construction equipment, machinery, and surplus material from Project site.
f. Leave Project clean and ready for occupancy.

6. The Electrical Work Contractor (Contract #5) shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
a. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
b. Wipe surfaces of electrical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
c. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Leave Project clean and ready for occupancy.

C. Pest Control: The General Work Contractor (Contract #2) shall engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 01 78 10

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents.

1.2 SUBMITTALS

A. Project Record Document Package: Comply with the following:

1. Submit Project Record Document Package as follows:

a. Submittal: Submit one set of electronic Project Record Document Package.

1). Electronic Media: uploaded as a compressed file or .zip file (containing submittal coversheet, sub folders, and .PDF Submittal Documents) to Contract Administration platform provided by Owner.

b. See Specification 017700 – Closeout Procedures for additional requirements on turnover of Project Record Documents after approval.

B. Project Record Document Package (submitted as compressed file or .zip) (assemble with sub folders for the following documents):

1. Submittal Coversheet for Record Document Package

2. Record Documents Table of Contents (Initially submitted as one independent Submittal).

3. Record Contract Drawings (Initially submitted as one independent Submittal).

a. Record Contract Drawing Mark Up Schedule (Include with Record Contract Drawings Submittal).

4. Record Contract Specifications. (Initially submitted as one independent Submittal).

5. Record Submittal Package: Record Preconstruction Submittals and Record Closeout Submittals:

a. Record Preconstruction Submittal Types (To have been previously approved during preconstruction submittal process):

1). Record Product Data Submittals.

2). Record Shop Drawing Submittals.

3). Record Sample Selection Submittals.

4). Other Miscellaneous Preconstruction Submittals.

b. Record Closeout Submittal Types (Submit Independently as new Closeout Submittals):

1). Operation and Maintenance Manuals

2). Warranties

3). Training Agendas

4). Training Documentation Sign in Sheets, Training Instruction Videos, and Video Recordings.

5). Start Up and Test Report Documentation.

6). All Documents required per 017820 - Operation and Maintenance Data.

7). Any other Miscellaneous Post Construction or other Miscellaneous Project Record Submittals as required by each specific Project Specification Sections.

6. Record Contract Modification Documents.

a. Copies of all Addenda.

b. Copies of Executed Change Orders or Construction Change Directives.

c. Copies of Executed Allowances.

d. Copies of Proposal Requests.

e. Copies of Contract Document Clarifications/Bulletins/ASIs

f. Copies of RFI's.

g. Copies of Project Schedules.

7. Record BIM/CAD Coordination Models, CAD Files of Shop Drawings, and Survey Electronic Files.

8. Record software configurations for custom programming applications.

9. Contractor's Subcontractor and Supplier Directory Contact List.

10. Contractor's Certification of "No Asbestos Materials Installed".

PART 2 PRODUCTS

2.1 RECORD DOCUMENT TABLE OF CONTENTS

A. A Table of Contents of Record Document Package shall be provided by the Contractor that lists all items, files, submittals, documents, and folders individually.

B. Files, Folders, and Subfolders listed on the Table of Contents are to have their titles and numbering match the folder/subfolder names of the items within the final Record Document Package.

C. Each PDF Document or Submittal to be titled as per key below: (1-2-3-4-5)

1. "Submittal Number"

a. Composed of "Specification Section Number" "-" "Submittal Number"

2. "Specification Section Title" (Abbreviate as required)

3. "Submittal Type" or "Description Title" (Abbreviate as required)"

4. Binder Tabulation Number or Record Drawing Set Number. (See Hard Copy Binder and Hard Copy Record Drawing Set Requirements)

a. "#" for Binder Tabulations. "DS" for Drawing Sets.

b. Binders to be divide into sections containing: 600 Sheets per binder maximum and 2-1/4″ maximum thickness of sheets within 3″ Binder.

5. "Approval Status and Date"

a. If the Specific Submittal has not been approved during submission of Final Closeout Package, indicate the item listed as "Not Reviewed" for items pending review.

b. Inclusion of Documents not independently reviewed and approved into the closeout package shall be at the discretion of the Construction Manager or Architect, other submit all items as independent Submittals.

D. Example Document File Names:

1. "230000-06R0 - Roof Top Units – Warranty-#6– APP-01.01.2020"

2. "080000-05R2 – Door Hardware – O&M – NOT REVIEWED"

3. "220000-03R5 – Sanitary Piping Record Drawings-#3 – APP – 03.03.2020"

E. Table of Contents to indicate Hard Copy Binder Division and Binder Identification, Binder Series Numbers, and Binder Section Tabulation Numbers.

1. Binders to be divide into sections containing: 600 Sheets per binder maximum and 2-1/4″ maximum thickness of sheets within 3″ Binder.

2.2 RECORD CONTRACT DRAWINGS

A. Record Contract Drawings: Maintain set of Contractor-provided Contract Drawings on site.

1. Preparation: Mark Record Contract Drawings to show the actual installation where installation varies from that shown originally.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique utilizing Electronic PDF drawing mark-up software. Use colors to distinguish between different categories of work.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional Changes to Drawings

b. Revisions to details shown on Drawings.

c. Revisions to routing and sizes of piping, conduits, and duct work.

d. Revision to Electrical Circuitry. Include updated Panel Schedules for all modified Panels.

e. Control or Equipment Panel Locations and functions.

f. Locations of Concealed internal utilities.

g. Locations of Valves, Control Valves, Dampers, Automatic Dampers, cleanouts and other major or specialty components of ductwork or piping systems.

h. Locations and depths of Underground Utility Locations.

i. All Partition Wall Blocking Locations.

j. Revisions to Programmed Systems Sequence of Operations.

k. Revisions to Programmed Systems User Interface Pages.

l. Change Orders, Allowance Authorizations, and Unit Price Authorizations.

1). (Indicate corresponding Proposal Requests or Clarifications if applicable)

m. Proposal Requests

1). (Indicate if Proposal Requests Contractor Proposals are approved or if proposal not accepted or not performed).

n. Architect Contract Document Clarifications: Bulletins, Architectural Supplementals Instructions, Architectural Sketches, Change in Conditions, or Information Bulletins.

3. Mark the Record Contract Drawings or Record Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark important additional information that was either shown schematically or omitted from original Drawings.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, the Contractor is to review marked-up Record Drawings with Architect.

1. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Identify Contractor and Architect Name on each Record Drawing.

1. Record electronic Drawings: Organize Record Drawing information into separate electronic files that correspond to each sheet of the Contract Drawings.

2. Identification: As follows:

a. Project name.

b. Date.

c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Architect.

e. Name of Contractor.

2.3 RECORD CONTRACT DRAWING MARK UP SCHEDULE:

A. Contract Drawing Mark Up Schedule: Provide Mark Up Schedule for Record Contract Drawings. Mark Up Schedule to indicate a list of mark ups applied to the Record Contract Drawings and Drawing Numbers of the Drawings that the mark ups are marked on

a. Include the following Mark Ups on Contract Drawing Mark Up Schedule:

1). Change Orders.

2). Allowance Authorizations.

3). Unit Price Authorizations.

4). Proposal Requests.

5). Architect Contract Document Clarifications.

2.4 RECORD CONTRACT SPECIFICATIONS

A. Provide Contract Specifications with Project Record Documents, including Addenda and Contract Modifications.

B. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.5 RECORD SUBMITTALS: RECORD PRECONSTRUCTION SUBMITTALS AND RECORD CLOSEOUT SUBMITTALS:

A. Each Record Preconstruction Submittal is to have been previously submitted and approved independently prior to incorporation into the final Record Submittal Package.

1. Where installed conditions differ from what is described in original Preconstruction Submittal, update the Record Preconstruction Submittal and submit as a new Record Submittal for re-approval.

B. Each Record Closeout Submittal is to be submitted initially as independent Submittals with each submittal containing an independent Submittal Coversheet for each Record Closeout Submittal and approved independently prior to incorporation into the final Record Submittal Package

C. Once each individual Record Submittal is independently approved, then the Record Submittals is be incorporated into the Record Submittal Package which is to be included in the Project Record Document Package for final review.

D. Within the Record Submittal Package: Provide Sub folders for each Specification Section and group all Record Submittals by Specification Section.

E. Sub Folders are to be labelled by Specification Section Number and Title. Abbreviate or simplify Specification Title text as needed for file name length software restrictions.

F. When Record Submittals are associated with work that an Operation and Maintenance Manuals have been provided for (as identified or grouped by Spec Section Number), include a copy of the Record Submittals as an inserted document in the Operation and Maintenance Manuals.

G. Preparation: Resubmit Record Preconstruction Submittals to indicate the actual product installation where installation varies substantially from that indicated in original preconstruction submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Contract Document Changes, and other Record Submittals where applicable.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: The Contractor is to provide a printed (minimum) size 24″ x 36″ set of Contract Drawings (with all changes via addenda marked) prior to start of construction for record drawing mark ups only by the Contractor’s personnel to record mark ups as soon as changes occur, do not wait until the end of the Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

3.2 TURNOVER OF APPROVED FINAL PROJECT RECORD DRAWING PACKAGE

A. Upon Approval of the Submittal Coversheet for the Final Project Record Document Package the Contractor shall provide via qualified print shop or approved equal: (2) Electronic Flash Drive Copies, 2 Hard Copy Binder Sets, and (2) Printed Record Drawing Sets.

1. The Contractor is to assemble an Electronic Flash Drive Copy of the Final Project Record Document Package onto (1) Single Flash Drive. Provide at least (2) duplicate Flash Drives that contain the Final Record Document Package to be turned over to the Construction Manager. (Flash Drive to possess enough memory capacity to contain entire Final Record Document Package on 1 Flash Drive.)

2. Hard Copy Binder Sets of the Final Project Record Document Package to be assembled as indicated within this section:

3. Printed Record Drawing Sets of Record Contract Drawings.

4. The Contractor is to provide a transmittal of the physical items being turned over to be received initially by the Construction Manager, and then turned over to the Owner. Include the Transmittal of the Project Record Document Package with the Final Application for Payment.

B. Hard Copy Binder Set of Project Record Document Package Requirements:

1. Binders to be sized as 3″ Maximum Heavy Duty Binders with D Rings. (O ring Binders to not be used).

2. Binders to be divide into sections containing: 600 Sheets per binder maximum and 2-1/4″ maximum thickness of sheets within 3″ Binder.

3. Include a copy of the "Table of Contents of Record Document Package" in all Binders.

4. Provide Numbered Binder Tabs between each Submittal or Document within Binder. Reference Binder Tab numbers on Table of Contents.

5. Provide Binder Labels on Face and Spine of Binder indicating:

a. Binder Identification (Record Document Package)

b. Binder Series Number ("Binder #" of "Total Number of Binders")

c. Contractor Name

d. Contractor Phone Number

e. Contractor Address

f. Contract Name

g. Project Name

h. Project Number

i. Owner Name

j. Owner Phone Number

k. Owner Address

l. Architect Name

m. Construction Manager Name

C. Printed Record Drawing Set Requirements:

1. Provide Large Format 24″ x 36″ Printed Drawing Sets of Record Contract Drawings.

END OF SECTION 017810

SECTION 01 78 20

OPERATIONS AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of systems and equipment.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 SUBMITTALS

A. Initial Submittal: Submit 1 draft electronic of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return 1 electronic copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 1 electronic copy of each manual in final form at least 15 days before final inspection. Architect will return electronic copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 1 electronic copy of each corrected manual within 15 days of receipt of Architect's comments.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guidelines, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.

6. Name and address of Architect.

7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft.white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.

4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or

supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation manuals.

2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

G. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION 017820

SECTION 01 82 00

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.

2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 SUBMITTALS

A. Instruction Program: Submit one electronic copy of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual for Owner's use.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training Videotape: Submit two copies at end of each training module.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.

2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.

3. Review required content of instruction.

4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including, overhead coiling doors, overhead coiling grilles and automatic entrance doors.

2. Equipment, including stage equipment, projection screens, loading dock equipment, waste compactors, food-service equipment, residential appliances and laboratory fume hoods.

3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.

4. Intrusion detection systems.
5. Conveying systems, including elevators, wheelchair lifts and cranes.
6. Gas equipment, including medical gas equipment and piping.
7. Laboratory equipment, including laboratory air and vacuum equipment and piping.
8. Heat generation, including, boilers, feedwater equipment, pumps, steam distribution piping and water distribution piping.
9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
11. HVAC instrumentation and controls.
12. Electrical service and distribution, including transformers, switchboards panelboards, uninterruptible power supplies and motor controls.
13. Packaged engine generators, including transfer switches.
14. Lighting equipment and controls.
15. Communication systems, including intercommunication, surveillance, clocks, programming voice and data and CCTV equipment.
16. Any other equipment not specifically listed that is part of these construction documents.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:
    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.
    h. Emergencies: [Include the following, as applicable:]
3. Instructions on meaning of warnings, trouble indications, and error messages.
    a. Instructions on stopping.
    b. Shutdown instructions for each type of emergency.
    c. Operating instructions for conditions outside of normal operating limits.
    d. Sequences for electric or electronic systems.
    e. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:
    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
    a. Diagnostic instructions.
    b. Test and inspection procedures.
7. Maintenance: Include the following:
    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.
8. Repairs: Include the following:
    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

2. Owner will furnish an instructor to describe Owner's operational philosophy.

3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

E. Demonstration and Training: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. Comply with requirements in Division 1 Section "Photographic Documentation."

2. At beginning of each training module, record each chart containing learning objective and lesson outline.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 018200

SECTION 02 41 19

SELECTIVE DEMOLITION

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 SECTION INCLUDES

A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to complete the demolition, removal and disposal work.

B. Included, but not limited to, are demolition and removals of existing materials, structures, equipment, or work necessary to install the new Work as shown and specified and to connect same with existing work in an approved manner.

C. Demolitions and removals which may be specified under other Sections shall conform to requirements of this Section.

D. Contractor shall obtain all required permits from any authorities having jurisdiction.

1.3 REFERENCES

A. 29 CFR 1926 - Safety and Health Regulations for Construction (Subpart T - Demolition)

B. 29 CFR 1910 - Occupational Safety and Health Standards

C. ANSI/ASSE A10- Construction and Demolition Safety Standards

D. AWS D12.1 - Reinforcing Steel Welding Code

1.4 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Owner's Representative in accordance with the requirements of the Work. Working drawings and shop drawings shall include, but not be limited to proposed methods, equipment and operating sequences to be used in performance of the demolition and removals work and handling of hazardous materials.

B. Schedule: Show coordination of operations and sequence for shut-off, capping, temporary services, continuation of utility services, and other applicable items to ensure no interruption of Owner's operations.

C. Sequence and Schedule: Submit a detailed schedule showing the sequence and duration of demolition activities.

1.5 JOB CONDITIONS

A. Protection:

1. Demolition and removal work shall be performed by competent workmen experienced in the various types of demolition and removal work required and it shall be carried through to completion with the prevention of damage or injury to structures, occupants thereof, work persons on the site, the public and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use of, and free and safe passage to and from, adjacent structures.

2. Contractor shall provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the surrounding buildings, work persons engaged in demolition operations, and adjacent construction.

3. Contractor shall take necessary precautions to control dust and dirt as required by the contract drawings. Dust and dirt shall be prevented from rising by wetting demolished masonry, concrete, plaster and similar debris. Contractor shall take necessary precautions to ensure proper disposal/collection of runoff dust and dirt control water to avoid damage to adjacent construction, or create hazardous/objectionable conditions (such as ice, flooding, and downstream pollution).

4. Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.

5. Contractor shall be solely responsible for making all necessary arrangements and for performing all necessary work involving the discontinuance or interruption of all utilities or services.

6. Any equipment, piping and appurtenances removed without proper authorization, and that are necessary for the operations of the existing or expanded facilities, shall immediately be replaced to the satisfaction of the Owner's Representative at no cost to the Owner.

7. Closing or obstructing of roadways, sidewalks, and passageways adjacent to the Work by the placement or storage of materials will not be permitted, and all operations shall be conducted with minimum interference to vehicle, pedestrian or other traffic.

8. Contractor shall repair damage caused by his operations to facilities to remain, or to any property belonging to the Owner at no additional cost to the Owner.

9. The work shall comply with 29 CFR Part 1926 -- Safety and Health Regulations for Construction, applicable provisions and recommendations of ANSI/ASSE

A10 -- Construction and Demolition Safety Standards, all governing codes and rules, and as specified herein or in the Detailed Specifications.

10. Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal.

11. Demolition and removal of hazardous materials shall be in accordance with applicable Federal, State and Local regulations.

B. Permits: Obtain all permits from all appropriate regulatory agencies required for closing or obstructing streets and sidewalks.

C. Condition of Equipment:

1. The Owner does not assume responsibility for the actual condition of equipment to be demolished and removed.

2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner so far as practicable. However, there is no guarantee by the Owner that the number of fixtures, amount of equipment or any other material of value existing at bidding time in the structures to be demolished will be present in the structures when they are demolished. Contractor shall have no claim against the Owner because of the absence of such fixtures and materials.

3. The information regarding the existing equipment shown on the Drawings is based on visual inspection and a walk-through survey only. Neither the Owner's Representative nor the Owner will be responsible for interpretations or conclusions drawn therefrom by Contractor.

D. Scheduling: Carry out operations so as to avoid interference with Owner's operations and work in the existing facilities.

E. Notification: At least 72 hours prior to commencement of a demolition or removal, Contractor shall notify the Owner's Representative in writing of his proposed schedule. The Owner will inspect the existing equipment or facilities and review with the Contractor those items which are to remain the property of the Owner. No removals shall be started without the permission of the Owner's Representative.

1.6 PRE-DEMOLITION MEETING

A. The Contractor shall have a pre-demolition meeting with the Owner's Representative, in the presence of the Owner, to review all of the work areas that will be affected by the removal of materials from demolition.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 EXECUTION

3.1 GENERAL

A. The work required shall be done with care, and shall include all necessary shoring, bracing, and support to prevent movement, settlement, or collapse of existing structures or facilities. Contractor shall be responsible for any damage which may be caused by demolition and removal work to any part or parts of existing structures or items designated for reuse or to remain. Contractor shall perform patching, restoration and new work in accordance with applicable technical sections of the Specifications and in accordance with the details shown on the Drawings.

B. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with contract drawings and all governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

2. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

3. The use of calcium chloride for dust control will not be allowed.

C. Contractor shall remove temporary work, such as enclosures, signs, guards, and the like when such temporary work is no longer required or when directed at the completion of the work.

D. Contractor shall dispose of all demolition materials, equipment debris, and all other items not marked or specified by the Owner or the Owner's Representative to remain as property of the Owner, off-site and in accordance with all existing applicable laws and regulations.

E. All construction and demolition debris that has come in contact with regulated solid waste is to be cleaned to the satisfaction of the Owner's Representative before leaving the site.

F. The use of explosives will not be permitted.

G. Dust Control: The Contractor is responsible for controlling visible dust caused by demolition activities. Dust control shall be provided as described in the contract drawings.

3.2 MECHANICAL REMOVALS

A. When underground piping is to be altered or removed, the remaining piping shall be properly capped. Abandoned underground piping may be left in place unless it interferes with new work or is shown, specified or otherwise required to be removed.

B. Provide all caps, plugs, blind flanges, shut-off valves and other work and materials required to remove existing piping from service and as necessary to keep existing piping in service where shown or required.

3.3 PAVEMENT, CURB AND SIDEWALK REMOVALS

A. Remove existing pavement, including base and surface courses, stabilized sub-bases, curbs, and gutters as required to construct new facilities or as shown. Before removing, saw a straight joint at least 1-1/2-inches deep between sidewalk and pavement designated for removal and that left in place. Curbs and gutters shall be removed to the nearest construction joint beyond the limit of demolition shown on the Drawings. If no construction joints lie close to the limits of demolition, curbs shall be cleanly cut to ensure a clean transition between existing and new curbing.

B. Provide for satisfactory transition between replaced pavement and sidewalks and the portions remaining in place.

3.4 MISCELLANEOUS REMOVALS

A. Contractor shall remove miscellaneous items where shown on the Drawings or where necessary for the construction of new structures or modification of existing structures.

3.5 MODIFICATIONS AND CLOSURES

A. Modifications shall conform to all applicable Specifications, the Drawings, and the directions and approvals of the Owner.

3.6 MAINTENANCE AND CLEAN UP

A. Contractor shall maintain the buildings, structures, and other Owner properties free from accumulations of waste, debris, and rubbish caused by the demolition and removal operations.

B. Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish, and shall wet down dry materials to prevent blowing dust.

C. At reasonable intervals during the progress of the demolition and removal work or as directed by the Owner's Representative, Contractor shall clean the Site and properties, and dispose of waste materials, debris, and rubbish.

END OF SECTION

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 03 10 00

CONCRETE FORMING AND 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. Form-facing material for cast-in-place concrete.
2. Form liners.
3. Insulating concrete forms.
4. Shoring, bracing, and anchoring.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:
   1. Exposed surface form-facing material.
   2. Concealed surface form-facing material.
   3. Form liners.
   4. Insulating concrete forms.
   5. Form ties.
   6. Waterstops.
   7. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
   1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
   2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
   3. Indicate location of waterstops.
   4. Retain first subparagraph below for when form liners are applicable.
   5. Indicate form liner layout and form line termination details.
   6. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
   7. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

C. Samples:
   1. For Form Liners: 12-inch by 12-inch (305-mm by 305-mm) sample, indicating texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC353.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

a. Wind Loads: As indicated on Drawings.

1) Horizontal Deflection Limit: Not more than L/600 of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

a. Plywood, metal, or other approved panel materials.
b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

1) APA HDO (high-density overlay).
2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 INSULATING CONCRETE FORMS

A. Insulating Concrete Forms: Concrete-forming system complying with ASTM E2634, consisting of two panels of insulation connected with cross ties.

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. Alleguard (formerly Amvic Building System).
b. BuildBlock Building Systems, LLC.
c. Fox Blocks; Airlite Plastics Co.
d. Nudura Corporation.

2. Insulation: ASTM C578, Type II, expanded polystyrene.

a. Thickness: Not less than 2-1/2 inches each face.
b. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1) Flame Spread: 25 or less.

3. Smoke Developed Index: 450 or less. Cross Ties: Polypropylene, with integral reinforcement supports, designed to allow passage of concrete during placement.
4. Core Thickness: 8 inches

2.4 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.

C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

D. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch .
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch .

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips.
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations as approved by Architect and Engineer.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Space vertical joints in walls

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF INSULATING CONCRETE FORMS

A. Comply with ACI 301 and manufacturer's instructions.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Install forms in running bond pattern.

1. Align joints.
2. Align furring strips.

D. Construct forms tight to prevent loss of concrete mortar.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect and Structural Engineer prior to forming openings not indicated on Drawings.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Shore insulating concrete forms to ensure stability and to resist stressing imposed by construction loads.

3.4 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F

for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achievedat least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 03 20 00

CONCRETE REINFORCING

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. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Engineer.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Mechanical Splice Couplers: ACI 318 Type 2, same material of reinforcing bar being spliced; tension-compression type.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. 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.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

END OF SECTION 032000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

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 this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, and insulating concrete forms.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.

2. Review the following:

    a. Special inspection and testing and inspecting agency procedures for field quality control.
    b. Construction joints, control joints, isolation joints, and joint-filler strips.
    c. Semirigid joint fillers.
    d. Vapor-retarder installation.
    e. Anchor rod and anchorage device installation tolerances.
    f. Cold and hot weather concreting procedures.
    g. Concrete finishes and finishing.
    h. Curing procedures.
    i. Forms and form-removal limitations.
    j. Shoring and reshoring procedures.
    k. Methods for achieving specified floor and slab flatness and levelness.
    l. Floor and slab flatness and levelness measurements.
    m. Concrete repair procedures.
    n. Concrete protection.
    o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
    p. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

5. Color pigments.
6. Fiber reinforcement.
7. Vapor retarders.
8. Floor and slab treatments.
9. Liquid floor treatments.
10. Curing materials.
11. Joint fillers.
12. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.

6. Air content.
7. Nominal maximum aggregate size.
8. Steel-fiber reinforcement content.
9. Synthetic micro-fiber content.
10. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
11. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
12. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
13. Intended placement method.
14. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect/Structural Engineer.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.

8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Aggregates.
6. Admixtures

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency

laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Regional Materials: Verify concrete is manufactured within 100 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I.
2. Fly Ash: ASTM C618, Class C or F.

D. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: See "Concrete Mixtures Section" for maximum aggregate size for each class of Concrete.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C260/C260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.

Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
7. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Synthetic macro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, 1 to 2-1/4 inches long.

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. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
b. Master Builders Solutions; brand of MBCC Group.
c. Sika Corporation.

2.4 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive 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. Foxfire Enterprises, Inc.
b. Stego Industries, LLC.
c. W. R. Meadows, Inc.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F : Any color.
c. Ambient Temperature Above 85 deg F: White.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating certified by curing compound manufacturer to not interfere with bonding of floor covering.

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. Dayton Superior Corporation.
b. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
c. Kaufman Products, Inc.
d. Master Builders Solutions; brand of MBCC Group.
e. W. R. Meadows, Inc.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.
4. Use corrosion-inhibiting admixture in exposed exterior concrete applications.

2.9 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for exterior footings, foundation walls, and exterior slab on ground.

1. Exposure Class: ACI 318 F2.
2. Minimum Compressive Strength4500 psiat 28 days.
3. Maximum w/cm: 0.45
4. Maximum Aggregate Size: 1 ½" nominal.
5. Air Content:
   a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
7. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than the rate indicated in the Structural Drawings.

B. Class B: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0.
2. Minimum Compressive Strength: 4000 psiat 28 days.
3. Maximum w/cm:.0.50
4. Maximum Aggregate Size: 1" nominal.
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
7. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 5.0 lb/cu. yd..

C. Class C: Normal-weight concrete used for interior footings.

1. Exposure Class: ACI 318 F0.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Max w/cm: 0.50
4. Maximum Aggregate Size: 1 ½" nominal.
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94 , and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, and grade beams, sealing entire perimeter to floor slabs, grade beams, or foundation walls.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect/Structural Engineer.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans.
5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch (below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-2.0, "Rough Form Finish": As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/4 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class B.
e. Locations: Apply to concrete surfaces not exposed to view.

2. ACI 301 Surface Finish SF-3.0, "Smooth Form Finish":

a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
b. Remove projections larger than 1/16 inch (3 mm).
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class A.
e. Locations: Apply to concrete surfaces exposed to view or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Grout-Cleaned Rubbed Finish:

a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
b. Do not clean concrete surfaces as Work progresses.
c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
d. Wet concrete surfaces.
e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, or sand-bed terrazzo.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

    a. Slabs on Ground:

        1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
        2) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
        3) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

4) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.
5) Specified Overall Value (SOV): F_F 50 and F_L 25 with minimum local value (MLV): F_F 40 and F_L 17.
6) Specified Overall Value (SOV): F_F 25 and F_L 20 with minimum local value (MLV): F_F 17 and F_L 15.

b. Suspended Slabs:
1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
2) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.
3) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.

        3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

d. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

3. After concrete has cured at least 14 days, correct high areas by grinding.

4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
d. Place, compact, and finish to blend with adjacent finished concrete.
e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.
2. Testing agency shall immediately report to Architect/Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect/Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31, ASTM C39, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172 shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing provides 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 C143:

a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests when concrete consistency appears to change.

3. Slump Flow: ASTM C1611:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231 pressure method, for normal-weight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

6. Compression Test Specimens: ASTM C31:

    a. Cast and laboratory cure two sets of six 6-inch by 12-inch or 4 inch by 8 inch cylinder specimens for each composite sample.
    b. Cast, initial cure, and field cure one set of four standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days. Retain one set of two laboratory-cured specimens for later testing if required.
    b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days. Retain one set of two field-cured specimens for later testing if required.
    c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is less than or equal to 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. 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.
11. Additional Tests:

    a. 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 Architect/Engineer.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect/Engineer.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Engineer.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 03 30 01

CAST-IN-PLACE CONCRETE FOR SITE WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-05 of the American Concrete Institute.

1.2 DEFINITIONS (Amendments to ACI 301, Section 1.2):

A. Exposed Construction: Exposed to view.

1.3 SUBMITTALS

A. Submittals Package: Submit product data for design mix(es) and materials for concrete specified below at the same time as a package.

B. Shop Drawings: Placing drawings for bar reinforcement.

C. Product Data:

1. Concrete design mix(es) with name and location of batching plant.
2. Portland Cement: Brand and manufacturer's name.
3. Fly Ash: Name and location of source, and DOT test numbers.
4. Air-entraining Admixture: Brand and manufacturer's name.
5. Water-reducing Admixture: Brand and manufacturer's name.
6. Aggregates: Name and location of source, and DOT test numbers.
7. Chemical Curing and Anti-Spalling Compound: Brand and manufacturer's name, and application instructions.
8. Bonding Agent (Adhesive): Brand and manufacturer's name, and preparation and application instructions.
9. Expansion Joint Filler: Brand and manufacturer's name.

D. Quality Control Submittals:

1. Certificates: Affidavit required under Quality Assurance Article.

1.4 QUALITY ASSURANCE

A. Concrete batching plant shall be currently approved as a concrete supplier by the New York State Department of Transportation.

B. Fly ash supplier shall be currently approved as a fly ash supplier by the New York State Department of Transportation.

C. Certifications: Affidavit by the bar reinforcement manufacturer certifying that bar material meets the contract requirements.

D. Source Quality Control: The Owner's Representative reserves the right to inspect and approve the following items, at his own discretion, either with his own forces or with a designated inspection agency:

1. Batching and mixing facilities and equipment.
2. Sources of materials.

1.5 STORAGE

A. Store materials so as to insure the preservation of their quality and fitness for the Work. Materials, even though accepted prior to storage, are subject to inspection and shall meet the requirements of the Contract before their use in the Work.

PART 2 PRODUCTS

2.1 MATERIALS (Amendments to ACI 301, Section 4, for Normal Weight Concrete and Section 7 for Lightweight Concrete):

A. Water-reducing Admixture: ASTM C 494, Type A, and on the New York State Department of Transportation's current "Approved List".

B. Fly Ash: ASTM C 618, including Table 1A (except for footnote A), Class F except that loss on ignition shall not exceed 4.0 percent.

C. Chemical Curing and Anti-Spalling Compound: ASTM C-309, Type 1D, Class B, with a minimum 18 percent total solids content. No thinning of material allowed.

1. SureCure Emulsion, Kaufman Products, Inc. 3811 Curtis Avenue, Baltimore, MD 21226, (800) 637-6372.
2. Cure & Seal by Symons Corp., 200 East Touhy Ave., PO Box 5018, Des Plaines, IL 60017-5018, (847) 298-3200.
3. "Kure N Seal W" by Sonneborn/ BASF Building Systems, 889 Valley Park Dr., Shakopee, MN 55379, (800) 433-9517.
4. Day-Chem Cure & Seal 26 percent (J-22) by Dayton Superior Corp., 721 Richard St., Miamisburg, OH 45342, (800) 745-3700.

5. Acrylseal HS by Master Builders/ BASF Building Systems, 23700 Chagrin Blvd., Cleveland, OH 44122, (800) 628-9990.

D. Type 1 Expansion Joint Filler: Preformed, resilient, non-extruding cork units; ASTM D 1752, Type II.

E. Chamfer Strips: Wood, metal, PVC or rubber; one inch chamfer.

F. Epoxy Bonding Agent (Adhesive): 100 percent solids epoxy-resin-base bonding compound, complying with ASTM C 881, Types I, II, IV and V, Grade 2 (horizontal areas) or Grade 3 (overhead/vertical areas), and Class B (40-60 degrees Fahrenheit) or Class C (60 degree Fahrenheit and above).

1. SurePoxy HM Series by Kaufman Products, Inc., 3811 Curtis Avenue, Baltimore, MD 21226, (800) 637-6372.
2. Sikadur Hi-Mod 32 by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071, (800) 933-7452.
3. Epogrip by Sonneborn/ BASF Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800) 433-9517.

2.2 PROPORTIONING (Amendments to ACI 301, Sections 4 & 7):

A. Compressive Strength: Minimum 4500 psi, unless shown or specified otherwise.

1. Concrete used in thrust blocks for underground water service piping shall have its bearing strength adjusted to suit onsite conditions. See specific bearing strength requirements for specific soil types

B. Weight: Normal

C. Durability: Concrete shall be air-entrained. Design air content shall be 6 percent by volume, with an allowable tolerance of plus or minus 1.5 percent for total air content. Entrained air shall be provided by use of an approved air-entraining admixture. Air-entrained cement shall not be used.

D. Slump:

1. 4500 psi Normal Weight Concrete: Between 2 inches and 3 inches before the addition of any water-reducing admixtures or high-range water-reducing admixtures (superplasticizers) at the Site.

E. Admixtures: Do not use admixtures in concrete unless specified or approved in writing by the Owner's Representative.

F. Selection of Proportions: Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches, unless otherwise approved in writing by the Owner's Representative. Proportion mix with a minimum cement content of 611 pounds per cubic yard for 4500 psi concrete.

1. Optional Material: Fly ash may be substituted for (Portland) cement in normal weight concrete up to a maximum of 15 percent by weight of the required minimum (Portland) cement. If fly ash is incorporated in a concrete design mix, make necessary adjustments to the design mix to compensate for the use of fly ash as a partial replacement for (Portland) cement.

    a. Adjustments shall include the required increase in air-entraining admixture to provide the specified air content.
    b. Lower early strength of the concrete shall be considered in deciding when to remove formwork.

2.3 REINFORCEMENT (Amendments to ACI 301, Section 3):

A. Bar Reinforcement: ASTM A 615, Grade 60, deformed steel bars.

B. Bar Supports: Galvanized steel or AISI Type 430 stainless steel, and without plastic tips.

C. Tie Wire: Black annealed wire, 16-1/2 gage or heavier.

2.4 JOINTS AND EMBEDDED ITEMS (Amendments to ACI 301, Section 5.3.2.6):

A. Obtain bond at construction joints by the use of bonding agent (adhesive) or the use of cement grout.

2.5 PRODUCTION (Amendments to ACI 301, Section 5):

A. Provide ready-mixed concrete, either central-mixed or truck-mixed.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Do not use items of aluminum for mixing, chuting, conveying, forming or finishing concrete, except magnesium alloy tools may be used for finishing.

B. Keep excavations free of water. Do not deposit concrete in water.

C. Hardened concrete, reinforcement, forms, and earth which will be in contact with fresh concrete shall be free from frost at the time of concrete placement.

D. Prior to placement of concrete, remove all hardened concrete spillage and foreign materials from the space to be occupied by the concrete.

3.2 FORMWORK (Amendments to ACI 301, Section 2):

A. Chamfer all exposed external corners of concrete.

3.3 PLACING REINFORCEMENT (Amendments to ACI 301, Section 3):

A. At the time concrete is placed, reinforcement shall be free of mud, oil, loose rust, loose mill scale, and other materials or coatings that may adversely affect or reduce the bond.

3.4 PLACING CONCRETE (Amendments to ACI 301, Section 5):

A. Operation of truck mixers and agitators and discharge limitations shall conform to the requirements of ASTM C 94.

B. Do not allow concrete to free fall more than 4 feet.

3.5 FINISHING FORMED SURFACES (Amendments to ACI 301, Section 5.3.3):

A. Finish Schedule: Except where indicated otherwise on the Drawings, provide the finishes below:

1. Rough Form Finish for concrete surfaces not exposed to view.
2. Architectural Finish (for concrete surfaces exposed to view): after pour, strip forms, rub finish with stone and wooden trowel while concrete is still green. The finish shall be architectural and free of nubs, spalls, irregularities and formwork seams.

3.6 FINISHING SLABS (Amendments to ACI 301, Section 5.3.4):

A. Finish Schedule: Except where indicated otherwise on the Drawings, provide the finishes below:

1. Floated Finish for:

    a. Treads and platforms of exterior steps and stairs.

2. Broom or Belt Finish for:

    a. Exterior slabs. Texture, as approved by the Owner's Representative.

B. Finishing, General: Provide monolithic finishes on concrete floors and slabs without the addition of mortar or other filler material. Finish surfaces in true planes, true to line, with particular care taken during screeding to maintain an excess of concrete in front of the screed so as to prevent low spots. Screed and darby concrete to true planes while plastic and before free water rises to the surface. Do not perform finishing operations during the time free water (bleeding) is on the surface.

3.7 CURING AND PROTECTION (Amendments to ACI 301, Section 5.3.6):

A. Maintain concrete surfaces in a moist condition for at least 7 days after placing, except where otherwise indicated. Do not use curing compound.

B. For surfaces of exterior slabs (on grade), apply chemical curing and anti-spalling compound in accordance with the recommendations of the manufacturer.

END OF SECTION

SECTION 03 35 43

CONCRETE TOPPING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the polished concrete floor finishing at interior slabs as shown on the drawings and specified herein.

1. Interior concrete topping applied to cast-in-place concrete surfaces.

1.3 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's product data with installation instructions for color additive and penetrating sealer.

B. Submit proposed location and details of construction joints to the Engineer for approval.

1.4 MOCK-UP

A. Mock-Ups: Cast colored concrete mockups to demonstrate typical joints, surface finish, bonding, texture, color, tolerances, and standard of workmanship.

1. Build mock-ups approximately 4'-0" x 4'-0" in the location indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mock-ups will be constructed.

3. Obtain Architect's approval of mock-ups before starting construction.

4. If Architect determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.

5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mock-ups when directed.

7. Provide mock-ups for light, medium, and hard sandblast finish; Architect will review for texture. Provide 4'-0" x 4'-0" mock-ups for interior finishes, minimum four mock-ups. Provide patterned concrete finishes as indicated.

PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III.

B. Standard Aggregate: ASTM C 33.

C. Standard Topping: Design mix to produce topping material with following characteristics:

1. Compressive strength, 3500 psi minimum.

2. Slump, 4" maximum.

3. Cement per cu. yd., 590 lb. minimum.

4. W/C ratio, 0.45 maximum.

D. Mixing: Provide batch type mechanical mixer for mixing topping material at project site. Equip batch mixer with a suitable charging hopper, water storage tank, and a water-measuring device. Use mixers that are capable of mixing aggregates, cement and water into a uniform mix within specified time, and of discharging mix without segregation.

1. Mix each batch of 2 cu. yds., or less, for at least 1-1/2 minutes after ingredients are in mixer. Increase mixing time 15 seconds for each additional cu. yd. or fraction thereof.

E. Joints: Provide control and construction joints as indicated or required. Use standard pre-molded joint filler at perimeters finished with backer-rod and sealant.

1. Key Joint Filler #780 as manufactured by Key Resin Company.

F. Reinforcing: Provide bar reinforcement as noted. Unless otherwise detailed or required, reinforce all areas with fiber mesh at rate required per manufacturer to minimize cracking.

G. Bonding Agent: Larsen's, for intended purpose.

H. Concrete Sealer: Subject to compliance with requirements, provide "Key Acrylic Sealer" as manufactured by Key Resin Company.

I. General: Decorative ground concrete is produced by grinding and finishing trowel finished cured concrete in a manner similar to that for terrazzo.

J. Do not consolidate concrete with the use of vibrating or tamping. Allow concrete to cure minimum 28 days.

K. Color Additive: ASTM C979.

1. Color: PC-1 - Cool Grey; shade as selected by Architect.

L. Polished Concrete Chemical Sealer/Hardener/Densifier Compounds:

1. High performance chemical densifier manufactured specifically for application over polished concrete.
2. Satin sheen to match finish luster as measured with specular gloss meter in accordance with ASTM D523 of 30 when measured with 60 degree meter.
    a. Acceptable Products:
        1) RetroPlate, Advanced Floor Products, Inc., Provo, UT
        2) Certi-Shine, Vexcon Chemicals, Inc., Philadelphia, PA
        3) FGS/Permashine, L&M Construction Chemicals, Inc., Omaha, NE.
        4) Perfect Polish.
        5) HTC Superfloor, HTC-America, Knoxville, TN.

M. Cleavage Membrane: ECB &5 Anti Fracture Membrane by NAC or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions where polished concrete floor finishing is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Ensure concrete has cured for sufficient amount of time before commencing polishing operations, in order to match texture of approved sample.

C. Verify that surfaces are clean, dry, dust free, and free of efflorescence, oil, or other matter detrimental to sealer/hardener application.

D. Verify that joint sealant work in adjoining surfaces is complete prior to applications of sealers. Delay application until sealants have cured.

3.2 PREPARATION

A. Provide protection as necessary to protect adjacent materials and surfaces from dirt, dust, and other surface or physical damage.

B. Remove loose particles, foreign matter, and oil by method which will not affect sealer/hardener application.

C. Prepare surfaces in accordance with manufacturer's directions.

D. Provide protection as necessary to protect adjacent materials and surfaces from dirt, dust, spillage, overspray and other surface or physical damage.

E. Once polished concrete flooring operations begin, do not allow construction traffic in work area until floor is completely finished and covered with protective materials to prevent damage and staining.

F. Follow CPAA (Concrete Polishing Association) recommendation for evaporation control and wet curing concrete slabs according to ACI308R-01

3.3 CLEAVAGE MEMBRANE

A. Follow manufacturer's guidelines.

3.4 INSTALLATION

A. Topping Applied to Hardened Concrete: Remove dirt, loose material, oil, grease, paint or other contaminants, leaving a clean surface.

1. Base slab surface shall be brushed with a coarse wire broom and roughened by chipping or scarifying before cleaning a minimum of 1/16" in depth.

B. At unbonded slabs, provided wire mesh bond breaking between existing slab and topping slab. Provide control joints in accordance with ACI requirements.

1. Prior to placing topping mixture, dampen concrete slab surface but do not leave standing water. Over dampened surface, and immediately before placing topping, apply bonding agent. Apply by brush or spray, and at recommended rates, in accordance with manufacturer's directions.

C. Placing and Compacting: Spread topping mixture evenly over prepared base, bring to required level with straight-edge and strike-off. After placement, do not work surface further until ready for floating. Begin floating when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power driven floats. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units.

D. Slab Finishes

1. Screed to true and level alignment unless indicated sloped on drawings, then uniformly slope as indicated.

2. Tool all salient edges of concrete.

3. Do not absorb water with neat cement.

4. Make sharp arrises at wall to floor conditions unless otherwise indicated.

5. Finish/steel trowel.

E. Floor Tolerances

1. Ff=50 / Fe=30

F. Cut down high areas and fill low areas. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth finish.

1. Wet cure topping after refloating surface.

G. Performance: Failure of concrete topping to bond to substrate (as evidenced by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace toppings in areas of such failures.

3.5 CONCRETE FINISHES

A. Polished Concrete Finish Preparation: Clean concrete of loose foreign matter.

B. Saw cut control joints and accent lines as indicated. Interior saw cut joints shall be grouted.

C. Clean dust and debris from saw cut joints and fill with approved epoxy joint filler colored to match with concrete color as selected by the Architect.

3.6 CONCRETE GRINDING

A. General: Follow manufacturer's instructions and use same procedures and personnel used in creating approved sample. Approved sample will be used to judge acceptability of polished concrete finishing.

B. Grinding:

1. Grind and smooth concrete with diamond impregnated abrasive discs fitted to large, heavy floor grinding and polishing machines. Use dry or wet method as approved by manufacturer for selected system.

a. Produce ground finish surface to match approved field sample.

b. Ensure 50 percent minimum aggregate exposure.

2. Initial Grinding

a. Grind concrete with #30 or #40 or finer diamond plates.

b. Follow initial grind with #80 or finer grit stones.

3. Grouting:

a. Cleanse with clean water and rinse thoroughly.

b. Remove excess rinse water and allow to dry.

c. Steel trowel cement paste to fill voids completely.

d. Allow grout to cure.

4. Final Grinding:

a. Polish with progressively finer grit stones to achieve medium reflectivity (800 grit) polish finish matching approved sample.

b. Cleanse with clean water and rinse thoroughly.

c. Remove excess rinse water and allow to dry.

3.7 SEALER APPLICATION

A. General

1. Provide finishes to match approved samples at locations indicated.

2. Apply materials in accordance with manufacturer's printed instructions.

B. Sealer/Densifier: Apply minimum of 2 coats of sealer/densifier to harden exposed concrete to depth of 1/16 to 1/8 inch of floor resulting in hardened floor with satin shine.

3.8 ADJUSTING, CLEANING AND PROTECTION

A. Repair or replace adjacent Work that has been damaged by finishing operations.

B. Clean up and remove debris daily.

C. Clean spillage, overspray, or drift from adjacent surfaces; remove immediately in accordance with manufacturer's instructions.

D. Once polished concrete flooring operations begin, do not allow construction traffic in work area until floor is completely finished and covered with protective materials to prevent damage and staining.

E. Protect finished concrete surfaces from damage by construction equipment and operations.

END OF SECTION 033543

SECTION 042000

UNIT MASONRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the unit masonry work as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Concrete block walls and partitions.
2. Concrete block enclosure for emergency generator and electrical transformer.
3. Decorative concrete unit masonry veneer.
4. Stone trim units.
5. Metal joint reinforcing, anchors, ties, weeps, closures, and related accessories for masonry.
6. Control and expansion joints in masonry, filled with joint fillers.
7. Through-wall flashing.
8. Cavity drainage material.
9. Chases, recesses, pockets, and openings in masonry as required for installation of work by others.
10. Building in of items furnished by others into masonry, including access doors, door frames, anchors, sleeves and inserts, and other similar items to be embedded in masonry.
11. Grouting in of metal items built into masonry work.
12. Protection, pointing and cleaning of masonry.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 033000.

B. Miscellaneous Metals - Section 055000, for steel lintels.

C. Thermal Insulation - Section 072100.

D. Sheet Metal Flashing - Section 076200.

E. Firestops and Smokeseals - Section 078413.

F. Joint Sealers - Section 079200.

1.4 REFERENCES

A. Indiana Limestone Institute of America, Inc. (ILI): Indiana Limestone Handbook, latest edition.

B. Brick Industry Association (BIA):

1. Technical Notes on Brick Construction, latest edition.

C. ASTM:

1. ASTM C90: Standard Specification for Loadbearing Concrete Masonry Units.

2. ASTM C91: Standard Specification for Masonry Cement.

3. ASTM C140: Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

4. ASTM C144: Standard Specification for Aggregate for Masonry Mortar.

5. ASTM C150: Standard Specification for Portland Cement.

6. ASTM C207: Standard Specification for Hydrated Lime for Masonry Purposes.

7. ASTM C270: Standard Specification for Mortar for Unit Masonry.

8. ASTM C331: Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

9. ASTM C404: Standard Specification for Aggregates for Masonry Grout.

10. ASTM C426: Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

11. ASTM C476: Standard Specification for Grout for Masonry.

12. ASTM C568: Standard Specification for Limestone Dimension Stone.

13. ASTM C1019: Standard Test Method for Sampling and Testing Grout.

14. ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

15. ASTM A641: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

16. ASTM A82/A82M: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

17. ASTM A36/A36M: Standard Specification for Carbon Structural Steel.

18. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

19. ASTM D1056: Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

1.5 SUBMITTALS

A. Submit Shop Drawings for the following:

1. Anchoring details.

2. Control and expansion joint locations and details.

3. Special decorative masonry shapes.

4. Flashing at typical lintels indicating relationship of flashing to lintel hangers.

B. Submit Samples for the following:

1. Decorative concrete unit masonry in color and texture as indicated.

a. Submit samples of all special shapes required showing color range and sizes.
b. Submit certification that block meets ASTM standards specified herein.

2. Stone trim units.

3. Joint reinforcing, each type, width, and proposed location (labeled).

4. Anchors, wedges and ties, each type, width, and proposed location (labeled).

5. Joint filler, each type.

6. Flashing, including splice sample, 12" long.

7. Mortar color, 12" long cured sample.

C. Submit technical and installation information for the following:

1. Mortar materials, each material and mortar type.

2. Certification of mortar mix.

3. Flashing material, descriptive literature.

4. Concrete block, joint reinforcing, anchors, ties, and joint filler; submit manufacturer's technical and descriptive literature.

5. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sampling of concrete block may be tested by an Independent Testing Laboratory retained by the Owner according to the requirements of ASTM C 140.

D. Cleaning Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect stone, gaskets, sealants, etc.

1.6 QUALITY ASSURANCE

A. Conform to the following non-cumulative tolerances (any masonry work not meeting these standards shall be re-built as directed by the Architect).

1. Variation from Plumb:

   a. In lines and surfaces of columns, walls and arrises:
      1). In 10 feet 1/8"
      2). In any story of 25 feet maximum 1/4"
      3). In 40 feet or more 1/4"
   b. For external corners, expansion joints and other conspicuous lines:
      1). In any story of 25 feet maximum 1/4"
      2). In 40 feet or more 3/8"

2. Variation from the level or the grades indicated on the drawings; for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:

   a. In any bay or 20 feet maximum 1/4"
   b. In 40 feet or more 1/4"

3. Variation of the linear building lines from established position in plan related portion of columns and partitions:

   a. In any bay or 20 feet maximum 1/4"
   b. In 40 feet or more 1/2"

4. Variation in cross-sectional dimensions of columns and in thickness of walls:

   a. Minus 1/8"
   b. Plus 1/8"

5. Variation in dimensions of masonry openings:

   a. Horizontal dimension -0" + 1/16"
   b. Vertical dimension +0" - 1/16"

B. Job Mock-Up: Prior to installation of masonry work, erect sample wall panel mock-up using materials, bonding patterns and joint tooling required for final work and including cavity wall, masonry sill, window unit and sill, projecting courses, anchors and reinforcement as detailed. Provide special features as directed by the Architect for caulking and contiguous work. Build mock-up at the site, 4' x 4' size as directed by the Architect, indicating the proposed range of colors, textures and workmanship to be expected in the completed work. Reconstruct mock-up if directed by the Architect until it meets with Architect's approval. Obtain Architect's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until work is completed and accepted by the Architect. Use sample panels to test proposed cleaning procedures after sample panel meets with Architect's approval.

   1. Approved sample panel shall remain on view at the site until completion of masonry veneer work and shall establish the technical and aesthetic standards for the Project.

C. Work of this Section shall conform to the requirements of the following:

   1. ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.

2. ACI 530-1/ASCE 6/TMS 602 Specifications for Masonry Structures.

3. Brick Industry Association (BIA) "Technical Notes on Brick Construction."

D. Pre-Construction Conference: Prior to installation of masonry and associated work, Contractor shall arrange a meeting with Masonry Subcontractor, installers of related work, and other entities concerned with masonry wall performance, including the Architect and Owner. Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least seventy-two (72) hours' advance notice to participants prior to convening conference. Review methods and procedures related to masonry work, including, but not limited to, the following:

1. Review masonry requirements (drawings, specifications, and other Contract Documents).

2. Review required submittals, both completed and yet to be completed.

3. Review and finalize construction schedule related to masonry work and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review required inspection, testing, certifying and material usage accounting procedures.

5. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

6. Coordinate work with air/vapor barrier membrane and related flashing, review details to avoid conflicts.

1.7 PRODUCT HANDLING

A. General: Deliver, store, handle and protect all materials from damage, moisture, dirt and intrusion of foreign matter. Store all masonry units and mortar materials on raised platforms and under ventilated and waterproof cover. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.

B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.

C. Aggregate: Store with provisions for good drainage.

D. Reinforcement and Anchors: Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar, and will not be disfigured or bent out of shape.

1.8 JOB CONDITIONS

A. In cold weather, when the outside temperature is below forty (40) deg. F., conform to the requirements of "Cold Weather Masonry Construction and Protection

Recommendations" publication by Brick Industry Association (BIA). No anti-freeze admixtures are permitted.

1. In addition, conform to the following:

   a. Masonry materials must be warmed as required.
   b. Masonry veneer work must be protected a minimum of 24 hours after installation so as to maintain enough heat for hydration of the cement in the mortar.

B. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg. F. and above. In addition, conform to the following:

1. Masonry materials must be cool.

2. Mortar must be used within 2 hours of initial mixing.

C. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24" down both sides and hold cover securely in place.

2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24" down face next to unconstructed wythe and hold cover in place.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

1.9 ATTIC STOCK

A. Provide additional 10% of dry mortar mix labeled, packaged, and delivered to location determined by Owner for attic stock.

B. Provide additional 5% of decorative concrete masonry units labeled, packaged, and delivered to location determined by Owner for attic stock.

PART 2 PRODUCTS

2.1 MATERIALS

A. Standard Concrete Block

1. Portland cement, ASTM C 150, Type 1, low alkali (less than 0.6%), single source for entire project.

2. Aggregates, ASTM C 331, lightweight expanded shale, clay, or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," or "Haydite."

   a. Block scheduled to receive painted finish shall contain normal weight aggregate meeting ASTM C 331 in addition to lightweight aggregate in order to receive a smooth, uniform finish.

3. Concrete Masonry Units: Load bearing lightweight aggregate concrete masonry units conforming to the requirements of ASTM C 90, Type 1.

   a. Block behind masonry veneer and block for rated walls shall be 75% solid units.
   b. All other block may be hollow units.

4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.

5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.

6. Finish: For exposed or painted block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.

7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.

8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.

9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-16, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

10. Water Content

a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Decorative CMUs: Conform to ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).

2. Density Classification: Normal weight.

3. Basis-of-Design Manufacturer: Westbrook Concrete Block.

a. Finish: Ground-face.
b. Color: GF-213A.

4. Size: 8-inch x 16-inch.

5. Thickness: 4-inch.

6. Corners: 4-inch “L Corner” 1F/1E from Westbrook.

C. Stone Trim Units: Stone for trim, sills, copings, etc. used in masonry walls shall be limestone conforming to ASTM C 568, Classification II Medium Density, of dimensions and profiles shown on drawings.

1. Grade and Color: Standard, buff; according to grade and color classification established by ILI.

2. Finish: Stone shall have a smooth finish on all exposed surfaces, unless otherwise indicated; concealed surfaces may be sawn. Edges to receive grout or sealant shall be sawn.

3. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces. Comply with recommendations in ILI's "Indiana Limestone Handbook."

D. Joint Reinforcing for Masonry Walls

1. For anchoring masonry veneer to CMU back-up, provide "280 S.I.S. Dub'l Loop-Lok Seismiclip Interlock System" as manufactured by Hohmann & Barnard or equal by manufacturer noted below in Para. D.5. All wire used in assembly shall be 3/16" dia. Assembly shall contain ladder reinforcing, welded loops, box tie, seismiclip and continuous wire in veneer mortar joint. Provide special formed prefabricated pieces at corners and intersections of walls or partitions. Reinforcing wire in veneer mortar joint to extend at least 2" into face of veneer unit. Show anchor locations on approved shop drawings.

a. Reinforcing assembly shall be hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft, after fabrication.

2. Masonry Joint Reinforcement for Single-Wythe Masonry: Provide either ladder or truss type with single pair of side rods.

3. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or partitions. Reinforcing shall be mill galvanized conforming to ASTM A 641, Class B-1, applied after fabrication.

4. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.

5. Approved Joint Reinforcing Manufacturers

   a. Hohmann & Barnard
   b. Wire-Bond
   c. Heckmann Building Products
   d. National Wire Products Industries, Inc.

E. Anchors and Ties

1. Dovetail Anchor Slots: Hot-dip galvanized steel, 16 gauge, equal to No. 100 Dovetail Anchor Slot made by Heckmann Building Products, No. 305 anchor slot made by Hohmann & Barnard, or approved equal by other manufacturers in Para. D.5.

   a. Flexible Metal Ties for Dovetail Slots: Hot-dip galvanized, 16 gauge by 1" wide by Heckmann Building Products Inc., or approved equal manufacturer noted above in Para. D.5.
      1). No. 106 Dovetail Corrugated Anchor.
      2). No. 129 Dovetail Triangle Tie.
   b. For anchoring masonry veneer to concrete back-up where there are no dovetail slots provided, provide "CMU/Concrete Screw Wing-Nut Pos-I-Tie" with five (5) gauge hot-dip galvanized (ASTM A 153, Class B-2) wire pintle tie made by Heckmann Building Products, or approved equal by manufacturer noted above in Para. D.5.

2. Wire Mesh: Hot-dip galvanized sixteen (16) gauge steel wire, square mesh, width 3" by length to suit condition; No. 268 by Heckmann Building Products, or approved equal by manufacturer noted above in Para. D.5.

3. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, or approved equal by manufacturer noted above in Para. D.5:

   a. Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
      1). No. 195 Column Anchors.
      2). No. 197 Column Anchors.
      3). No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties.
      4). No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties.
   b. Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.

1). No. 355 Column Anchors.
2). No. 356 Column Anchors.
3). No. 357 Beam Anchors.
4). No. 359 F anchor straps with VWT tie.

4. For anchoring CMU interior partitions to underside of steel beams, provide hot dip galvanized steel tube anchors equal to No. 419 and No. 421 made by Heckmann Building Products, No. PTA-420 made by Hohmann & Barnard, or approved equal by manufacturer noted above in Para. D.5.

5. For anchoring CMU interior partitions to underside of structural deck, provide 4" x 4" x 1/4" galvanized steel angles (ASTM A 36), 3'-0" long spaced 3'-0" o.c. alternately on each side of partition. Anchor partition securely to structural deck.

F. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.

G. Control and Expansion Joint Fillers

1. Vertical Installation Within Concrete Masonry Wall: Extruded high-grade neoprene rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block, and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint).

a. Provide the following sizes:
1). 2-5/8" wide control joint fillers for 4" block walls.
2). 4-5/8" wide for 6" block walls.
3). 6-5/8" wide for 8", 10" and 12" block walls.
b. Provide backer rod and sealant joint over joint filler as per drawings and Section 079200 of these specifications.

2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Acceptable joint filler shall be "Everlastic, Type NN-1" by Williams Products, Inc., or approved equal. Recess joint filler and install backer rod and sealant as per drawings and Section 079200 of these specifications.

3. Within Masonry Veneer: Provide filler rod and sealant installed by Section 079200. Filler depth shall be 2 times joint width.

a. Compressible filler between top of masonry veneer and bottom of shelf angle shall be "Soft Joint Sealant" made by Polytite, or approved equal.

4. Within Expansion Joint at Masonry Veneer: Manufacturer's standard preformed, pre-compressed, open-cell polyurethane foam sealant impregnated with a water based, non-drying polymer modified acrylic water repellent. Provide "Seismic Colorseal" installed to twenty-five 25 percent compression, as manufactured by Emseal or approved equal.

a. Properties: Permanently elastic, mildew resistant, non-migratory, non-staining, and compatible with joint substrates and other joint sealants. Density: 8.4 to 9.1 lb./cu. ft.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type 1, standard color, one source.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: Clean, washed, buff colored sand, graded per ASTM C 144.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean, fresh, and suitable for drinking.

2.3 MORTAR MIX

A. Exterior Masonry Veneer Construction: Mortar mixes shall meet ASTM C 270, Type N, cement/lime mortar. Colors of mortars shall use coloring agent made by Davis Colors, Lehigh Cement or approved equal. Color of mortar to meet with Architect's approval. The Contractor may use pre-packaged colored mortar equal to "Color Mortar Blend" made by Glen-Gery.

1. Color of mortar must match Architect’s approved sample and mock-up panel.

B. Exterior Block Back-Up Construction: Provide Portland cement/lime mortar as noted above conforming to ASTM C 270, Type N.

C. Interior Masonry Construction: Provide Portland cement/lime mortar conforming to ASTM C 270, Type N, for load bearing conditions, mortar shall conform to ASTM C 270, Type M.

D. Reinforced Concrete Block: Provide Portland cement/lime mortar conforming to ASTM C 270, Type S.

E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have a minimum compressive strength of 3000 psi when tested in accordance with ASTM C 1019.

F. Mixing

1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.

2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes, not to exceed five (5) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.

3. Acceleration or other admixtures not permitted.

4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

G. Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.

2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.

3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

2.4 MASONRY ACCESSORIES

A. Neoprene Joint Filler: Provide closed cell neoprene, Type NN-1, conforming to ASTM D 1056, Grade 1, high performance, as manufactured by Williams Products Inc., or equal made by D. S. Brown, Norton, or approved equal.

B. Weep Holes: Provide clear plastic weep holes 3/8" wide and 1-1/2" high by four (4) inches long equal to No. 342 made by Hohmann & Barnard or approved equal manufacturer listed above.

C. Through-Wall Flashing: Provide sheet membrane flashing as part of exterior wall membrane system. Provide sealants and tapes as recommended by the manufacturer. Provide preformed corner sections "end dams" with system when flashing is discontinuous.

1. Provide flashing for surface adhered applications at sheathed areas with 26 ga. stainless steel termination bar.

2. Wall flashing shall have 26 ga. stainless steel drip edge adhered to edge of flashing, drip edge shall be set in sealant as specified in Section 079200.

D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

E. Cavity Drainage Material: Provide 10" high HDPE "Mortar Net" open mesh mortar net of width to fit masonry cavity shown on drawings, manufactured by Hohmann & Barnard, Inc., or equal "Mortar Break II," made by Advanced Building Products.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. 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.

2. Verify that masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.

3. Do not start any work until mock-ups are approved by the Architect.

B. Discrepancies: In the event of discrepancy, immediately notify the Architect in writing. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Starting of work by the Contractor means acceptance by the Contractor of the substrate.

3.2 COORDINATION

A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 INSTALLATION

A. General

1. Do not wet concrete block units.

2. Build walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.

3. Build chases and recesses as shown or required for the work of other trades.

4. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

5. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and offsets. Avoid the use of less than half size units at corners, jambs and wherever possible.

6. Lay up walls plumb and true with courses level, accurately spaced and coordinated with other work.

7. Pattern Bond: Lay exposed masonry patterns as noted on drawings. If not shown, provide running bond. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs.

8. Walls and partitions shall be plumb, true to line and free from defects such as open cells, voids, dry joints and other similar defects.

9. Mortar, ties, and reinforcement must not extend into or bridge any expansion joints.

10. For best appearance and water resistance, tuckpoint scored joints on interior and exterior applications.

B. Mortar Bedding and Jointing

1. All joints between masonry veneer units shall be completely filled with mortar. Bed joints shall be beveled per BMI recommendations, with the veneer units then shoved in place. At cavity wall construction, care shall be taken that no excess mortar goes into masonry cavity. Head joints shall be completely filled with mortar and shall be formed by applying a full coat of mortar to the entire end or the entire side, as the case requires, and then shoving the mortar covered end and/or side of the veneer unit tightly against the veneer units previously laid; the practice of “slushing” by throwing mortar into the head joints will not be permitted. All veneer units shall be laid without disturbing the units previously laid. Veneer units shall be laid within a minute or so after the mortar is placed. Dry or butt joints will not be permitted. Grouting shall be done only as necessary. Do not slush head joints.

2. After veneer unit placement, mortar squeezed out of bed joints shall be cut off before tooling.

3. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.

   a. To ensure alignment of masonry veneer and block coursing, adjust block back-up by cutting block to insure alignment of coursing or use adjustable anchorage.

4. Lay masonry walls with 3/8" joints unless otherwise shown on drawings.

5. Tool exposed joints slightly concave after the mortar joint is thumbprint hard. Concealed joints shall be struck flush, including at any CMU schedule to receive a waterproofing or air barrier membrane.

6. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

C. Stopping and Resuming Work: Rake back 1/2 unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

D. Built-In Work

1. As the work progresses, build in items specified under this and other Sections of these specifications. Fill in solidly with masonry around built-in items.

2. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.

3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.

4. Sleeves, pipes, ducts, and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 079200, so as to be airtight and prevent air leakage. Refer to Section 078413 for packing of voids in rated masonry walls.

5. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting or hanging devices embedded in the cell including stone anchors and window or curtain wall anchors.

6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.

7. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.

8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.

9. Masonry indicated as being reinforced shall have all voids filled solid with grout. Grout shall be consolidated in place by vibration or other methods which insure complete filling of cells. When the least clear dimension of the grouted cell is less than two (2) inches, the maximum height of grout pour shall not exceed twelve (12) inches. When the least clear dimension is two (2) inches or more, maximum height of grout pour shall not exceed forty-eight (48) inches. When grouting is stopped for one (1) hour or longer, the grout pour shall be stopped 1-1/2" below the top of a masonry unit. Vertical bar reinforcing shall be accurately placed and held in position while being grouted, and shall be in place before grouting starts. All such reinforcing shall have a minimum clear cover of 5/8". Lap all bars a minimum of forty (40) bar diameters and provide steel spacer ties (not to exceed 192 bar diameter) to secure and position all vertical steel and prevent displacement during grouting. Provide continuous horizontal reinforcement embedded in mortar joints every second course.

E. Cutting and Patching

1. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.

2. Do not saw cut any masonry openings in veneer construction without Architect's approval and after a procedure has been reviewed and approved.

3. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.

4. All masonry which requires patching in exposed work, if approved by Architect, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Architect's satisfaction. Rake back joints and use pointing mortar to match as required.

F. Solid Wall Construction

1. Fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.

2. Tie wythes with continuous horizontal reinforcement embedded in mortar joints sixteen (16) inches o.c. vertically.

G. Interior Block Partitions (not used)

H. Ties and Anchors for Masonry Construction

1. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed 16" o.c. horizontally and/or vertically. Provide additional ties within 1'-0" of all openings and adjacent to expansion joints and spaced not more than 16" apart around perimeter of openings.

2. Anchoring Masonry to Structure: Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.

I. Control and Expansion Joints

1. Provide expansion, control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.

2. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 40'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:

   a. At structural column or joint between bay.
   b. Above control joints in the supporting structure.
   c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 6'-0" wide and at both sides for openings over 6'-0" wide.
   d. At reduction of wall thickness.
   e. Where masonry abuts supporting structure.
   f. If additional joints are required, indicate same on approved shop drawings.

3. Masonry Veneer Expansion Joint Spacing: Vertical expansion joints in veneer construction shall be located maximum 20'-0" o.c. unless otherwise noted in addition to expansion joints located within 2'-0" of each corner of the building.

J. Lintels

1. Install loose steel lintels furnished by Section 055000, allowing eight (8) inch bearing at ends.

2. For concrete block walls, use specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the following table, filled with grout.

Number and Size of Reinforcing Bars Required at Concrete Block Lintels		
Maximum Clearance Span	Wall Width	Rebar No. - Size
2'-0" to 6'-0" 6'-0" to 8'-0"	6"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	8"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	12"	3 - #3 3- #4

3. U-shaped concrete block lintels shall extend a minimum of 8" at each side of opening.

3.4 FLASHING/WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at relieving angles, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated. Space weeps 16" o.c. unless otherwise shown on drawings. Weeps shall occur immediately above the flashing.

B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing.

C. Flashing shall be placed, generally, at bottoms of cavity wall construction, over all wall openings, window jambs, at sills of window, and in other locations where indicated on the drawings. Flashing shall overlap a minimum of 6". At bottoms of cavity walls, the flashing shall be built extending from the exterior face of the veneer unit, up and into the mortar joint 2" at the inner wythe of the CMU back-up; at sheathed areas attached with pressure bar. Extreme care shall be exercised in placing the masonry materials not to damage the flashing. Flashing damaged during the masonry erection shall be repaired or replaced by the Contractor at no additional cost to the Owner. Discontinuous flashing shall terminate with an end dam in a head joint, rising at least 1".

D. When spanning an air space, flashing shall be supported with a mortar wash, insulation or treated wood blocking.

E. Where flashing is penetrated by anchors, patch flashings at penetration using adhesive and mastic recommended by the manufacturer to insure watertight seal.

F. Install flashing in accordance with manufacturer's instructions, using adhesive, primer, thinner, cleaner and mastic as recommended by flashing manufacturer.

1. Flashing shall overlap adjacent piece of flashing a minimum of 6".

G. Provide drip edge when flashing extends beyond face of veneer.

H. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.5 CLEANING, PROTECTION, ADJUSTMENT

A. Protection

1. The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.

2. Excess mortar shall be wiped off the masonry surfaces as the work progresses.

3. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged during the progress of the entire project.

4. Protective measures shall be performed in a manner satisfactory to the Architect.

5. Damaged masonry units shall be replaced to satisfaction of the Architect.

6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.

B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the BIA Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.

1. Unless otherwise required by cleaning agent manufacturer use only low-pressure device (30 to 50 psi) for application of cleaning agent and water rinsing.

C. Pointing: Point any defective joint with mortar identical with that specified for that joint.

END OF SECTION 042000

SECTION 04 72 00

Cast Stone

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, equipment and services necessary to provide sill / projecting cast stone band and accessories as indicated on Drawings, specified herein, and as needed for a complete and proper installation.

1.2 DESIGN REQUIREMENTS

A. No air-entraining admixtures or material containing such shall be permitted in the mortar. Also, no anti-freeze compounds, calcium chloride, or other compounds, unless expressly permitted otherwise, shall be permitted in the mortar.

B. Mortar types to be used at the following locations, unless otherwise stated:

1. General Setting – Type N

1.3 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. Cast Stone Institute (CSI)

C. American Concrete Institute (ACI).

D. Concrete Reinforcing Steel Institute (CRSI).

E. American Society for Testing and Materials (ASTM).

1.4 SUBMITTALS

A. Product Data

Submit Product Data to show compliance with specified requirements.

1. Submit complete data for reinforcement.

2. Portland Cement used in mortar: Brand and manufacturer's name.

3. Lime used in mortar: Brand and manufacturer's name.

4. Mortar and Stone Pigments: Brand and manufacturer's name.

5. Packaged Products: Manufacturer's specifications and application instructions.

6. Sand used in mortar: Location of pit, name of owner, and previous test data.

7. Anchors and other ties.

8. Cast Stone cleaner. Also provide cast stone manufacturer’s recommended cleaning procedure for the cleaning product to be used and required adjacent material protection requirements.

B. Shop Drawings

1. Shop Drawings showing complete information for fabrication and erection of the Work of this Section, including, but not limited to:

   a. Plan and elevation of all stone location with dimension and joint locations. Show location of corresponding joint in adjoining masonry. Stone identification marks used on plan shall be used on fabricated unit.

   b. Show fabrication and installation details for cast stone. Include dimensions and cross sections; details, locations, size, and type of reinforcement. Indicate finished faces.

      1) If changes to the profile are proposed, show existing profile in dotted line and new or proposed profile in solid line clearly depicting the proposed changes.

   c. Erection procedures, sequence of erection, and required handling equipment.

   d. Layout, dimensions, and identification of each precast unit corresponding to the sequence and procedure of installation.

   e. Details of inserts, connections, and joints, including accessories.

   f. Location and details of anchorage devices that are to be embedded in other construction.

   g. Anchorages, including special reinforcement and lifting devices necessary for handling and erection.

C. Samples: Review of samples by the Architect will be for color, texture, and general condition only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1. Cast Stone: Submit 3 cast stone samples approximately 12" x 12" ", showing quality, texture, and color of the proposed finish.

2. Samples for Initial Selection of Mortar Color: Submit the full range of colors available.

3. Samples for Verification of Mortar Color: For each mortar color required, submit the full range expected in the finished construction. Make samples using the same ingredients to be used on Project. Label samples to indicate type and amount of colorant used.

4. Submit 3 samples each of anchorages and other attachments and accessories.

D. Quality Control Submittals

1. Mix design for the cast stone showing each aggregate, cement, pigment, admixture, water to cement ratio, and unit weight. If wet cast, show air content and slump. Include aggregate gradation and fineness modulus that was used in the sample subject to the required freeze-thaw test. Include acceptable limits for the gradation to meet pass the testing.

2. Laboratory tests reports, by a qualified independent testing laboratory, as specified in Article titled "Source Quality Control".

   For Cast Stone Institute (CSI) certified plants, the 6-month regular plant-performed testing for each 500 ft^3 may be provided for all tests by an independent lab in lieu of project specific testing.

   a. For Cast Stone Institute (CSI) certified plants, the 6 month regular independent tests and plant performed testing for each 500 ft^3 may be provided in lieu of tests for each 500 ft^3 of project material by an independent lab. Provide proof of CSI plant certification and membership in good standing.

3. Sieve analysis of aggregates for each 500 ft^3 of project production run.

4. Certificates

   a. Statements that manufacturer, installer, adhesive anchor installer and test laboratory have the specified qualifications. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

b. Statements that cast stone and mortar materials meet the single source requirements indicated under "Quality Control".

c. For wet-cast units, **c**ertification that air-entraining admixture is compatible with other admixtures used by the admixture manufacturer.

5. Field quality control test samples, if required.

E. Warranty

1. Manufacturer's Warranty

1.5 QUALITY ASSURANCE

A. Qualifications

1. Installer: A firm with at least 3 years experience in installing cast stone units of a type and quantity similar to those indicated for this Project. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

2. Manufacturer: A supplier experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance **of 5 years**, as well as sufficient production capacity to manufacture required units.

3. Testing Laboratory: An independent testing laboratory qualified according to ASTM E329 to conduct the testing specified. Lab is also to be qualified by CSI or demonstrate experience in performing the testing required by ASTM C1364.

B. Regulatory Requirements

1. Building Code: Work of this Section shall conform to all requirements of the NYS Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

C. Source Quality Control

1. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.

2. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

3. Cleaning

   Prior to cleaning all stones, perform mock-up on two stones to verify cleaner and technique will not damage stones nor the adjoining surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver the Work of this Section to the job site in such quantities and at such times as to assure the continuity of construction; carefully pack or crate to prevent damage.

B. Store units at the job site in a manner to prevent cracking, distortion, warping, staining, and other physical damage, and in a manner to keep markings visible.

C. Lift and support the units only at designated lifting points or supporting points as shown on the approved Shop Drawings.

D. Any units damaged before final acceptance shall be replaced.

E. Patching of units will not be acceptable, except as permitted in Article 2.02.

F. Pack, handle, and ship cast stone units in suitable packs or pallets.

   1. Lift using only manufacturer installed or approved field installed lifting devices. Do not lift with wide-belt slings or wire ropes to avoid chipping units. Move cast stone units, if required, using dollies with wood supports.

   2. Store cast stone units on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation. Place nothing on top of cast stone pallets. Do not double stack without manufacturer's written permission.

G. Store installation materials on elevated platforms, under cover, and in a dry location.

H. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Construction Requirements

   1. Per Section BC 2104.1, cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F or the temperature of masonry units is below 40°F.

   2. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.

B. Hot Weather Construction Requirements

Per the requirements of Section BC 2104.1, hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when temperatures exceed 100°F, or 90°F with a wind velocity greater than 8 mph.

1.8 WARRANTY

A. Provide a 5-year warranty that all parts of the cast stone will be free from defects in material and workmanship.

PART 2 - PRODUCT

2.1 MATERIALS

A. Cast Stone

1. Portland Cement: ASTM C150, Type I, white, containing not more than 0.60 percent total alkali when tested according to ASTM C114.

2. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33; gradation as needed to produce required textures. Used for wet mix process.

3. Fine Aggregates: Manufactured or natural sands complying with ASTM C33, gradation as needed to produce required textures.

4. Coloring Admixture for Cast Stone: ASTM C979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, non-fading, and alkali resistant. Limit pigment loading to 10% of total cementitious material.

5. Water: Shall be clean potable water free of injurious foreign matter.

6. Air-Entraining Admixture: ASTM C260, certified by the manufacturer to be compatible with other admixtures used.

   a. Add to wet-cast process mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 8 percent. For dry-cast process mixes, it is required if needed to meet the freeze-thaw resistance criteria, as verified by freeze-thaw testing.

7. Other Admixtures: ASTM C494

8. Reinforcement: Deformed steel bars complying with ASTM A615.

   a. Galvanizing: ASTM A767

9. Inserts: Fabricated from stainless steel complying with ASTM A276 or ASTM A666, Type 304 **or** steel hot dip galvanized in accordance with ASTM A123.

B. Anchors

1. Eye rods: Type 304 stainless steel complying with ASTM A276.

2. Pins/Dowels: Round stainless-steel bars complying with ASTM A276, Type 304, 1/2" diameter **minimum**.

3. Strap Anchors for building with back-up wall: 1/8" thick minimum stainless steel, Type 304 conforming to ASTM A240. See Drawings for sizes and shapes.

C. Mortar

1. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color, white, or a blend to produce mortar color indicated.

2. Hydrated Lime: ASTM C207, Type S.

3. Mortar Aggregate: ASTM C144.

   a. White-Mortar Aggregates: Natural, white sand or ground, white stone.

4. Mortar Coloring: Provide pure mineral pigments, natural and synthetic iron oxides, and chromium oxides compounded for use in mortar mixes. Material shall conform to ASTM C979. Coloring shall not contain alkalyde salts. No liquid colorants shall be permitted. Use only pigments with record of satisfactory performance in masonry mortars.

5. Water: Shall be clean potable water free of injurious foreign matter.

D. Accessories

1. Cast Stone Cleaner**:** Cleaner shall be as recommended by the manufacturer and capable of adequately cleaning stones of mortar droppings and other stains without damaging adjoining surfaces.

2. Sealant

   a. Sealant as specified in Section 07900 - Joint Sealers, as applicable for vertical joints and for horizontal joints.

   b. Bond breaker tape as specified in Section 07900 - Joint Sealers.

2.2 CAST STONE UNIT FABRICATION

A. Provide cast stone units complying with ASTM C1364 for the following attributes:

1. Compressive Strength: At 28 days after manufacture, not less than 6500 psi, when tested in accordance with Test Method ASTM C1194.

2. Absorption, Cold Water: At 28 days after manufacture, not greater than 6%, when tested in accordance with ASTM C1195.

3. Free-thaw Resistance: The CPWL shall be less than 5% after 300 cycles of freezing and thawing in accordance with ASTM C1634, with testing performed per ASTM C666.

4. Linear Shrinkage: Shrinkage shall not exceed 0.065% when tested in accordance with ASTM C426.

5. Air Content: For wet cast product, shall be between 4 to 8% when tested in accordance with ASTM C173 or C231. Air entrainment is not required for the dry cast method.

B. Colors and Textures

1. As selected by Project Architect from manufacturer's full range for colors and textures. As a minimum, provide samples of the following colors in multiple textures for the Architect to select:

a. Corinthian Cast Stone standard color: Limestone - Buff (LS1)

b. Corinthian Cast Stone standard color: Limestone - Warm Tan (LS38)

c. Corinthian Cast Stone premium color – Arctic White

d. Corinthian Cast Stone premium color – Eggshell

2. Color shall be uniform for each unit and consistent for all units.

C. Fabrication

1. General

a. Fabricate the Work of this Section to the sizes and shapes indicated, and of texture matching the approved Samples.

b. Provide finished units that are straight, true to size and shape, and within the specified casting tolerances.

c. Make exposed edges sharp, straight, and square, unless indicated otherwise. Make flat surfaces into a true plane.

d. Stones that are warped, out of tolerance, broken, spalled, stained, have continuous effloresce, surface-crazed, have cracks, have a deteriorating surface and/or are otherwise defective are not acceptable and are to be replaced. Stones with chips may be repaired if no more than an 1½" in any length and only after test patches have been deemed acceptable by the AEOR. Patches shall match color and texture. Patches are to be done by a manufacturer-trained technician utilizing the manufacturer's recommended mix manufacturer and guaranteed by the Contractor for the same 5-year period as the manufacturer's warranty. If patches are deemed not acceptable, units shall be replaced.

e. Place and secure in the forms all anchors, clips, stud bolts, inserts, lifting devices, shear ties, and other devices required for handling and installing the precast units and for attachment of subsequent items as indicated or specified.

f. Reinforce units as indicated and as required by ASTM C1364. Use galvanized reinforcement. Damage to the galvanizing is to be repaired with appropriate material conforming to ASTM A780.

g. Install lifting points and hardware for all units exceeding 65 pounds/LF. No slings are to be used as the primary lifting apparatus.

2. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.

a. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.

b. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.

c. Provide drips on projecting elements, unless otherwise indicated.

3. Casting tolerances

Maintain casting, bowing, warping, and dimension tolerance below the following maximums:

a. Overall dimension for height and width of units:

Plus zero, and minus 1/16" of unit length.

b. Make thickness of units plus or minus 1/8" maximum.

c. Bowing or warping: Do not exceed 1/360 of the length.

d. Insert locations: Place within plus or minus 1/4" in each direction.

4. Cure and finish units as follows:

a. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for a minimum of 24 hours. Follow PCI recommendations.

b. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350˚F.

c. Utilize appropriate methods to meet the finish specified in paragraph B above without need to repair. If none is specified, provide fine-grained surface imitating Indiana limestone.

2.3 MORTAR MIXES

A. Setting Mortar

1. Shall conform to ASTM C270 and BIA M1-88. Provide Type I Portland cement. Masonry cement and masonry mortar shall not be used as a substitute. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range, which should generally be near the minimum strength of the next higher strength mortar (e.g. Type N many times is in the 2000 to 3000 range).

a. Type M: 1 part gray cement, 1/4 part lime, $3^{3}/_{4}$ parts dry sand. Minimum compressive strength shall be 2500 psi at 28 days.

b. Type N: 1 part gray cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi at 28 days.

B. Mortar Color: Proportion mortar coloring with other mortar mix ingredients to obtain desired color, as approved by the AEOR. Do not exceed 1 part pigment to 10 parts cement, by weight. If consistent color cannot be obtained, provide as a minimum premixed Portland cement and coloring from major cement manufacturer.

2.4 SOURCE QUALITY CONTROL

A. Employ an independent testing agency to sample and test cast stone according to ASTM C1364 and the specific test methods specified in Article titled "Cast Stone Units".

Include testing for:

1. Compressive Strength in accordance with Test Method ASTM C1194. Test units from each 500 ft^3 of cast stone.

2. Absorption, Cold Water, in accordance with Test Method ASTM C1195. Test units from each 500 ft^3 of cast stone.

3. Resistance to Freezing and Thawing in accordance with Test Method ASTM C666, Procedure A. Test one unit from each cast stone mixture design.

B. Provide sieve analysis of the aggregate for each batch with each shipment of material to show compliance with the gradation limits of the accepted cast stone mix design for which the ASTM C666 test was performed.

C. If test specimens fail or the sieve analysis does not match that of the test specimen used for the freeze-thaw test, the specimens and the entire 500 ft^3 lot they came from shall be rejected and shall not be used in the project.

D. If the plant is CSI certified, the requirements for Source Quality Control testing by an independent lab for each 500 ft^3 of material for the individual project can be replaced by the test reports by the plant for every 500 ft^3 of material manufactured by the plant required by CSI and the six month independent lab tests required by ASTM C1364, if the mix utilized is the manufacturer's standard mix for which the ASTM C1364 testing was performed. If the mix for the project is new, the testing of the production run is to be performed. See Article titled "Submittals" for certification and other submittals required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION

A. Cover top of masonry wall with waterproof plastic membrane at the end of the work period, when work is not in progress, and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.

B. During cold weather, do not use wet masonry units and frozen masonry units.

C. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.

D. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.

E. Brace walls as needed until sufficiently set, or until intersecting walls provide lateral support.

F. Prevent masonry cleaners from coming in contact with adjacent glass, metal, and other masonry surfaces such as cast stone. Protect adjoining glass and metal surfaces and all other adjacent materials and property from masonry operations.

3.3 MIXING PROCEDURES FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, measure ingredients by container. Do not measure by shovel.

B. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.

C. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Mortar shall be used within $2^1/_2$ hours after initial mixing. Limit amount of mortar batched at one time to stay within these requirements.

3.4 INSTALLATION

A. Do not install units that do not meet the aesthetic requirements of the specification.

B. Coordinate as required with other trades to assure proper and adequate accommodation with the Work of this Section.

C. Set cast stone as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

D. Drench units with clear water just before setting.

E. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set. Anchors **are** to be set in substrate with adhesives.

1. Sills: Set 3/8" of mortar prior to installation of flashing providing full bed. Rake joint 3/8" to allow for bondbreaker tape and sealant installation under flashing. Seal flashing penetrations with sealant. Install another 3/8" mortar on top of flashing and place stone. Provide full bed of mortar and tool joint. After stones are set and mortar cured, install bond breaker tape and sealant under the flashing.

2. Fill dowel holes and anchor slots with mortar.

3. Fill collar joint solid as units are set, if part of solid masonry construction. If part of a cavity construction, keep area clear of mortar.

4. Build concealed flashing into mortar joints as units are set.

F. After units are set in or on the wall they shall have all top surfaces covered and protected from the elements at the close of each day's work and shall be kept covered and protected until all the Work is completed.

G. Lead, Plastic or hard rubber buttons shall be used in setting large units to sustain the weight until mortar has set.

H. Units with horizontal surfaces subject to water (windowsills, projecting stone bands, etc.): All transverse joints between units (not bed joints) shall be raked out 3/8" deep and shall be filled with joint sealer, (after bond breaker tape) as specified in Article titled "Accessories".

I. Expansion Joints

Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

Provide expansion joints at a maximum spacing of approximately 20 feet on center. Match joint spacing with facade expansion joints.

Provide filler seal, bond breaker tape, and joint sealers at expansion joints where indicated on the Drawings and where required for proper installation. (See Section 079000 Joint Sealers).

Keep joints free of mortar and other rigid materials.

J. Discrepancies

1. Immediately notify Architect and Construction Manager.

2. Do not proceed until fully corrected.

3.5 INSTALLATION TOLERANCES

A. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.

B. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

C. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.6 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses. Protect adjoining surfaces from damage. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, and after completion of other work liable to damage or soil cast stone units, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape. Follow fabricators recommendations for type of cleaners.

3. Clean in conjunction with the cleaning of all other masonry work. Perform a mock-up the cleaning procedure demonstrating the units will not discolor or burn using the manufacturer's recommended dilution rate and dwell time. Do not clean in temperature below 50°F. Drench all units with water prior to application of approved cleaner. Clean by scrubbing with cleaner and water, applied vigorously with stiff fiber brushes. After scrubbing, drench all surfaces of the cast stone units thoroughly with clean water. The use of sand blast, wire brushes; etc**.** will not be permitted under any circumstances for the cleaning of cast stone Work. Start the cleaning operation at the top of the structure and proceed downward.

END OF SECTION 047200

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:

1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 055000 "Metal Fabrications" for other steel items not defined as structural steel.
3. Section 099000 “Painting and Finishing” for painting requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Shop primer.
7. Galvanized-steel primer.
8. Etching cleaner.
9. Galvanized repair paint.
10. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Delegated-Design Submittal: For all structural-steel connections to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator, professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Combined system of moment frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992, Grade 50.

B. Channels, Angles: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

2.4 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36 carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain.

2.5 PRIMER

A. Steel Primer:

1. Comply with 099900 +Painting and Finishing
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6 and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
4. Galvanized surfaces unless indicated to be painted.
5. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
1. SSPC-SP 3.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E165.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

    a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.

    a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1 and the following inspection procedures, at testing agency's option:

        1) Liquid Penetrant Inspection: ASTM E165.
        2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
        3) Ultrasonic Inspection: ASTM E164.
        4) Radiographic Inspection: ASTM E94.

3.7 PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780.

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 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in 99900 “Painting and Finishing”.

END OF SECTION 051200

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 05 12 10

STRUCTURAL STEEL-TO-STEEL INSULATED 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: Engineered, factory-fabricated, thermally broken structural assemblies for connecting exterior structural steel framing to interior structural steel framing.

B. Related Sections:

1. Section 051200 "Structural Steel Framing" for placing connection anchors, and welding and erection of adjacent steel framing.

1.3 REFERENCE STANDARDS

A. ASTM: American Society for Testing Materials.

1. ASTM A276: Standard Specification for Stainless Steel Bars and Shapes.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate work with installation of connections to supporting structural components.
2. Furnish anchorage items to be embedded in, or attached to, other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.
3. Coordinate selection of shop primers to structural steel assemblies with selection of topcoats or fire protective coatings to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include assembly locations, plans, elevations, dimensions, shapes and sections, and support conditions. Detail fabrication and installation of structural thermal break assemblies.

1. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
2. Detail connections.
3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
4. Indicate location of each thermal break assembly unit by same identification mark placed on assembly unit.
5. Indicate relationship of assemblies to adjacent materials.

C. Delegated Design Submittal: For structural thermal break assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, installer, inspection agency and professional engineer.

B. Material Certificates: For the following, from manufacturer:

1. Structural steel components.
2. Anchors.

C. Thermal Design: Provide thermal modeling analysis indicating compliance with performance requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following, indicating compliance with performance requirements.

1. Each type of structural thermal break assembly.
2. Studs, nuts, and washers including mechanical properties and chemical analysis.

E. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Assumes responsibility for engineering structural thermal break assemblies to comply with the performance requirements.
2. Assumes responsibility for preparation of Shop Drawings and comprehensive engineering analysis by a qualified engineer.
3. Has minimum of 5 years' experience in the manufacture of structural thermal break products for concrete applications.
4. Has experience with North American projects of a similar scope and scale.

B. Installer Qualifications: Qualified installers must attend a preconstruction meeting with the manufacturer to review installation requirements for the thermal break assembly prior to installation. Preconstruction meetings may be held either in person or virtually.

C. Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with the following specifications and documents, as applicable to types of structural thermal break assemblies indicated, unless modified by requirements in the Contract Documents.

1. Steel Construction:

a. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.

b. AISC 341 and AISC 341s1 - Seismic Provisions for Structural Steel Buildings Including Supplement No. 1.

c. AISC 360 - Specifications for Structural Steel Buildings.

d. Specification for Structural Joints Using ASTM A 325 or A 490 Bolts by Research Council on Structural Connections (RCSC).

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original containers and packaging, and place units with labels or other identifying marks clearly visible to allow for inspection.

B. Store assemblies with adequate support and protect units to prevent contact with soil, to prevent staining, and to prevent displacement or physical damage.

1. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause displacement or physical damage. Protect exposed ends of reinforcement to prevent injury; provide continuous wood bar across ends, or suitably sized plastic caps.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide Isokorb products by:

1. Distributor: Schöck USA Inc., 2 Advantage Court, Unit B, Bordentown, NJ 08505, Tel. 855 572 4625, info-na@schoeck.com www.schoeck.com

B. Substitutions: Comply with requirements in Division 01 Section for "Substitution Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design structural thermal break assemblies, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Provide structural thermal break assemblies and connections capable of withstanding the following design loads:

1. Provide assembly connections capable of withstanding dead loads, snow loads, and design loads in conformance with applicable codes and the following:

a. Design Moment: As indicated on Drawings.

b. Shear Force: As indicated on Drawings.

c. Axial Load: As indicated on Drawings.

2. Design assemblies and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, accommodate live-load deflection, shrinkage and creep of primary building structure and other building movements. Maintain structural concrete deflections within limits of ACI 318 (ACI 318M) and AISC 360.

a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 30 to plus 120 deg F.

2.3 STRUCTURAL THERMAL BREAK ASSEMBLIES

A. Steel-to-Steel Connection: Provide thermal break assemblies, engineered, tested and sized to suit structure as indicated.

B. Accessories:

1. Threaded Rods, Nuts, and Anchors: Stainless Steel, engineered to meet performance requirements.
2. Lubricate threaded parts of with an anti-seize thread lubricant during assembly.

2.4 FABRICATION

A. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Weld studs according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

2. Remove, re-weld, or repair incomplete and defective welds.

B. Reinforce structural thermal break assemblies to resist handling, transportation, and erection stresses.

C. Protect strand ends and anchorages with manufacturer recommended removable protective coatings or coverings to avoid corrosion.

D. Discard and replace structural thermal break assembly units that do not comply with requirements, including structural, manufacturing tolerance.

E. Size assemblies to accommodate required thicknesses of integrated thermal barrier materials.

F. Fabrication Tolerances: Fabricate structural break assemblies straight and true to size and shape and to applicable requirements of ACI 117.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean connection plates of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond connection efficacy.

3.3 INSTALLATION

A. Install structural thermal break assemblies according to manufacturer's written instructions and approved shop drawings.

B. Install structural thermal break assemblies level, plumb, and square within specified allowable tolerances. Provide temporary structural supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection or support.

C. Accurately position, support, and secure reinforcement against displacement, and in accordance with Manual of Standard Practice by CRSI. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

D. Field cutting of components is not permitted without approval of the Engineer/Architect.

E. Field welding of components is not permitted.

F. At bolted connections, use lock washers, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

G. Installation Tolerances:

1. Maximum Variation from Plumb and Level of Structural Thermal Break Assemblies: 1/8 inch (3 mm).

3.4 FIELD QUALITY CONTROL

A. Inspections: Owner will engage an inspecting engineer to perform field inspections and prepare reports determining compliance with the structural plans.

1. Provide inspector access to installed assemblies to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

2. Inspections:

a. Steel members and welds.

b. Studs.

3. Inspector will report findings promptly and in writing to Contractor and Architect.

4. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

5. Prepare inspection reports.

END OF SECTION 051210

SECTION 05 21 00

STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. KCS-type K-series steel joists.
3. Joist accessories.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications"

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications".

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete =construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Canam Buildings US Inc.; Canam Group Inc.
2. New Millennium Building Systems, LLC.
3. Vulcraft/Verco Group; a division of Nucor Corp.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use LRFD.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:
   a. Roof Joists: Vertical deflection of 1/360 of the span.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Top-Chord Extensions: Extend top chords of joists with SJI's Type R top-chord extensions where indicated, complying with SJI's "Specifications."

D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

E. Do not camber joists.

F. Camber joists according to SJI's "Specifications.

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

B. Primer: Provide shop primer that complies with Section 099912 "Interior Painting."

2.5 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

D. Welding Electrodes: Comply with AWS standards.

E. Galvanizing Repair Paint: ASTM A780/A780M.

F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

C. Shop priming of joists and joist accessories is specified in Section 099912 "Interior Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1.

1. In addition to visual inspection, test field welds according to AWS D1.1 and the following procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165.
b. Magnetic Particle Inspection: ASTM E709.
c. Ultrasonic Testing: ASTM E164.
d. Radiographic Testing: ASTM E94.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.4 PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION 052100

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

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 this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

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 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Canam Steel Corporation; Canam Group, Inc.
2. New Millennium Building Systems, LLC.
3. Vulcraft; Nucor Corporation, Verco Group.

B. 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, and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard.

2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), G60 (Z180) zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard.
4. Deck Profile: As indicated.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.
7. Span Condition: Triple span or more.
8. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

END OF SECTION 053100

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all materials, labor and equipment to properly install the following Work:

1. Provide exterior structural non-load-bearing steel stud wall framing for the lateral support of exterior wall material finishes.

2. Provide steel stud wall framing for interior partitions, soffits and ceilings.

1.1 SUMMARY

A. Section Includes:
1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Ceiling joist framing.
4. Soffit framing.

B. Related Requirements:
1. Concrete Panels: Section 074247
2. Gypsum Drywall: Section 092900

1.2 PREINSTALLATION MEETINGS

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Vertical deflection clips.
5. Single deflection track.
6. Double deflection track.
7. Drift clips.
8. Ceiling joist framing.
9. Soffit framing.
10. Post-installed anchors.
11. Power-actuated anchors.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the Steel Framing Industry Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Comply with the following AISI Specifications and Standards:

1. AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members."
2. AISI S200, "North American Standard for Cold-Formed Steel Framing – General Provisions."
3. AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."
4. AISI S240, "North American Standard for Cold-Formed Steel Structural Framing."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ClarkDietrich.

B. MarinoWARE.

C. Super Stud Building Products Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
   b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
   c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure,

connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of L/360.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S240.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with AISI S240 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips, Exterior: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0428 inch.
b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0428 inch.
b. Flange Width: equal to sum of outer deflection track flange width plus 1 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips, Interior: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with

flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0329 inch.
b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0428 inch.
b. Flange Width: equal to sum of outer deflection track flange width plus 1 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.7 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193 , ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Torque-controlled expansion anchor Torque-controlled adhesive anchor or adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 or Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M MIL-P-21035B or SSPC-Paint 20.

B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches or as indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.
4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches or as indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated on Shop Drawings.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 50 00

MISCELLANEOUS METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Rough hardware.
2. Open riser steel service stairs at Mechanical Equipment Room.
3. Loose steel lintels.
4. Light steel framing and supports not included as part of work of other trades.
5. Steel gratings and frames.
6. Steel plate covers and frames.
7. Miscellaneous steel trim, corner guards, angle guards and channels.
8. Countertop supports.
9. Trench drains.
10. Masonry support steel.
11. Sleeves in concrete walls and slabs.
12. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
13. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
14. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

A. Structural Steel Framing - Section 051200.

B. Painting and Finishing - Section 099000.

1.4 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:

1. "Manual of Steel Construction," American Institute of Steel Construction.

2. AWS D1-1 "Structural Welding Code," American Welding Society.

3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.

4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.

5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

6. American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

E. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.

F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

1.5 PERFORMANCE STANDARDS

A. Stairs and railings shall be constructed to conform to the following performance standards:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. Railings shall be designed to resist loads 2020 New York State Building Code.

1.6 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

C. Engineering Data

1. Before any stairs, ladders or railings are fabricated, submit engineering data drawings to the Architect for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

D. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

E. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metals

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 1011 or ASTM A 36.

4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

5. Structural Steel Sheet: Hot rolled, ASTM A 1011; or cold rolled, ASTM A 1008, Class 1; of grade required for design loading.

6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Anchor Bolts: ASTM F 1554, Grade 36.

4. Lag Bolts: ASME B18.2.1.

5. Machine Screws: ASME B18.6.3.

6. Plain Washers: Round, carbon steel, ASME B18.22.1.

7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.

1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Galvanizing Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.2 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or approved equal.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall conform to the following:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.

2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.

4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.

6. ASTM A 924: Galvanized Coating on Steel Sheets.

7. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (e.g.: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.4 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.

2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.

1. Welding

a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.

b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work

1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.

2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.

3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

1. Remove welding flux.

2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Open Riser Service Stairs

1. General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding. Provide complete stair assemblies, including metal framing, hangers, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

2. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

3. Attach treads to stringers by means of brackets made of steel and angles or bars. Weld brackets to strings and attach metal treads to brackets by welding, riveting or bolting.

4. Provide platforms of same metal as treads and in thicknesses required to support design loading. Attach platform to platform framing members with welds.

5. Steel Floor Plate Treads and Platforms: Provide raised pattern steel floor plate complying with FS QQ-F-461, Class I. Provide diamond pattern.

   a. Form treads of 1/4" thick steel floor plate with integral nosing and back edge stiffener. Weld steel supporting brackets to strings and treads to brackets.
   b. Fabricate platforms of steel floor plate. Provide nosing matching that on treads at all landings. Secure to platform framing members with welds.

C. Loose Steel Lintels: Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than eight (8) inches bearing at each side of openings, unless otherwise indicated.

1. Loose lintels shall conform to the following Schedule:

Opening Width (Maximum)	WALL THICKNESS		
	4 inches	6 inches	8 inches*
2'-0"	3-1/2" x 3-1/2" x 1/4"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 1/4"
3'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
4'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
5'-0"	4" x 3-1/2" x 3/8"	6" x 4" x 3/8"	4" x 3-1/2" x 5/16"
6'-0"	5" x 3-1/2" x 3/8"	6" x 4" x 3/8"	5" x 3-1/2" x 5/16"
7'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 1/2"	5" x 3-1/2" x 3/8"
8'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 5/8"	5" x 3-1/2" x 3/8"

* Two angles at all openings in eight (8) inch walls.

2. At columns or vertical surfaces where lintels cannot bear on masonry, provide clip angles sized for structural capacity of lintel.

D. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

E. Steel Gratings and Frames: Provide hot dipped galvanized steel gratings with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.

1. Manufacturer: Provide gratings manufactured by McNichols, IKG, Ohio Gratings, or approved equal.

2. Hinged Section: Provide hinged sections in areaway gratings where required by the drawings. Each hinged section up to 4'-0" wide shall be provided with two (2) five knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4'-0" wide shall be provided with three (3) butt hinges. Hinged sections shall have provisions for padlocking on the underside.

3. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.

4. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:

   a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
   b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4", whichever is less.
   c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4", whichever is less.
   d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

F. Pit Covers and Frames: Provide minimum 1/2" thick steel checkered plate cover, reinforced as required to limit deflection to 1/360 of span, with two (2) recessed lifting handles capable of supporting five hundred (500) lbs. each. Furnish covers with steel angle frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized. Plate covers shall be capable of supporting same loads as adjacent floor surfaces.

G. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

H. Corner Guards: Provide steel corner guards where shown. Unless otherwise indicated, use 4" x 4" x 1/4" steel angles to a height of four (4) feet above finished floor with 1-1/4" x 8 1/4" bent steel strap anchors welded to backs of angles at each end and approximately sixteen (16) inches o.c. Set and adjust guards to finish flush with adjacent surfaces.

I. Countertop Supports: Steel framing as indicated or required to support countertops. Conceal framing under countertops and within wall behind countertops. Provide supports to withstand a concentrated load of not less than three hundred (300) lbs. applied at any point with a deflection not to exceed L/240 for the length of the countertop.

J. Trench Drains: Provide Series R-4999 trench frame with Type A grated cover, heavy duty, made of ductile iron as manufactured by Neenah Foundry Co., or approved equal, sizes as shown on drawings. Assembly shall have asphalt coating. Grate shall be bolted in place with stainless steel hex head cap screws.

K. Masonry Support Steel

1. Provide galvanized steel, relieving angles, plates, accessories, and other steel shapes for masonry support steel; for lintels refer to Para. E. herein.

2. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.

3. Coordinate masonry support system with concrete work for locations of wedge inserts.

4. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

L. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.

2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop

welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION 055000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 062000

CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Blocking and miscellaneous wood.
2. Plywood backing panels for telephone and electrical closets.
3. Rough hardware.
4. Installation only of finish hardware.
5. Installation only of doors and hollow metal frames.

1.3 RELATED SECTIONS

A. Architectural Woodwork - Section 064023.

B. Roofing - Section 074113.

C. Steel Doors and Frames - Section 081113.

D. Flush Wood Doors - Section 081416.

E. Finish Hardware - Section 087100.

1.4 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20.

B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

D. Grade Marks: Identify lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of

lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.

a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.

E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.5 SUBMITTALS

A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

1.6 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

A. General

1. All wood shall be sound, flat, straight, well-seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.

2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot, or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.

3. Concealed Plywood backing and rough carpentry for telephone and electrical closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire-retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P49 and be free of halogens, sulfates and ammonium phosphate.

   a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.

2. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPA Standard U1, (.25 lbs./cubic foot of chemical in wood).

   a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.

3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:

1. Bolts: ASTM A 307, Grade A.

2. Nuts: ASTM A 563.

3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material for Treated Woods and Exterior Use: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2. Material for Other Uses: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

B. Unless otherwise noted, mount hardware units at heights established in Section 081113.

C. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.

H. Adjusting and Cleaning

1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory.

2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Install frames in accordance with ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100 "Thermal Insulation."

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 042000 "Unit Masonry" for installation of frames in masonry walls.

6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

7. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.

8. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.

    a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

9. Glazing: Comply with installation requirements in Section 088000 "Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.

    a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Wood Doors

1. Condition doors to average prevailing humidity in installation area prior to hanging.

2. Install doors in accordance with manufacturer’s instructions.

3. Fit door to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

4. Clearances: Install doors to meet clearance requirements specified in Section 081416.

5. Fire-Rated Doors: Install in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80. Provide clearances complying with the limitations of the authority having jurisdiction.

D. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.

3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.

2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.

3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.

2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.

3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.

4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.

5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 TELEPHONE AND ELECTRICAL EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood backing panels between the studs of the telephone and electrical equipment rooms in accordance with the requirements of the local utility company.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper

size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.7 CLEANING UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.

B. Sweeping

1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.

2. Remove the refuse to the area of the job site set aside for its storage.

3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION 062000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 064023

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural woodwork as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Wood trim and base.
2. Wood millwork and counters with plastic laminate finish.
3. Hardware for architectural woodwork.
4. Wood shelving.
5. Wood framing and rough lumber as required for work of this Section.
6. Wood grounds, blocking, nailers, furring as required for work of this Section.
7. All rough hardware and fastenings for work of this Section.
8. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.
9. Back painting as specified herein.
10. Shop finish of work of this Section, except items indicated herein to be shop primed only.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000.

B. Caulking between architectural woodwork and any wall, floor, or ceiling joints - Section 079200.

C. Flush Wood Doors - Section 081416.

D. Field finishing of architectural woodwork - Section 099000.

1.4 REFERENCES

A. American Lumber Standards Committee (ALSC): American Lumber Standards Simplified Practice Recommendation R-16, latest edition.

B. Architectural Woodwork Institute (AWI): Architectural Woodwork Standards (AWS), latest edition.

1.5 QUALITY STANDARDS

A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards" (AWS), 2nd Edition, dated July 1, 2016, shall apply to all workmanship, including materials and installation, for architectural woodwork, and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWS unless otherwise modified herein.

B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report. The cost of said inspection and report shall be borne by the Contractor.

C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.

D. Woodworking firm must be accredited by the AWI Quality Certification Program (QCP).

E. Provide fire test reports by an accredited testing laboratory of all woodwork demonstrating compliance with fire rating classification as required by Code.

1.6 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings of all woodwork specified and indicated on the drawings. Shop drawings shall indicate room plans and elevations at 3/4" equals 1'-0" scale and typical construction details at 3" equals 1'-0" scale. Shop drawings shall indicate all materials, thicknesses, and finishes.

2. Shop drawings shall show all finish hardware, anchors, fastenings, and accessories.

3. Shop drawings shall show all jointing, joint treatment and butt jointing in veneers and plastic laminate.

4. Shop drawings for cabinet work must show centerline height and horizontal location of all required internal wall blocking.

5. Where architectural woodwork deviates from AWI standards noted herein, shop drawings must identify these deviations.

B. Samples: Submit samples of each of the following items:

1. Plastic laminate, twelve (12) inches square, including a section of outside corner.

2. Transparent finish for each species of wood veneer laminated to particleboard, twelve (12) inches square, for each finish specified or shown.

3. Opaque finish wood veneer laminated to particleboard, twelve (12) inches square for each color, gloss and finish specified or shown.

4. Each type and finish of each type of wood trim, base, etc., eight (8) inches long, finish as specified.

5. Cabinet hardware.

1.7 QUALIFICATIONS

A. The work of this Section shall be provided by a firm having a minimum of five (5) years' experience on projects of similar size and quality to that specified and shown.

1.8 COORDINATION

A. Coordinate the work of this Section with other appropriate Sections of the specifications to insure proper scheduling for fabrication and installation of the work specified herein.

B. Coordinate with partition and finish trades to insure that proper provisions are made for the installation of the work specified herein.

C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to assure proper fit.

1.9 PRODUCT HANDLING

A. All materials and work of this Section shall be protected from damage from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.

B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.

C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.

D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

1.10 JOB CONDITIONS

A. Humidity Controls: The ambient relative humidity at the site, including both the storage and the installation areas, shall be maintained between 25% and 55% prior to delivery and through the life of the installation.

B. Determine equilibrium moisture content and maintain required temperature and relative humidity as required for a tolerance of plus or minus one (1) percent of the specified optimum moisture content until woodwork receives specified finishes. Refer to "Guide to Wood Species Selection," AWI, for method of determining equilibrium moisture content values.

C. Examination of Substrate and Conditions: The installer must examine the substrate and the conditions under which the work of this Section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

D. Areas to receive architectural woodwork must be fully enclosed with windows and/or curtain wall installed and glazed, exterior doors in place, HVAC systems operational, and temporary openings closed. Any plaster, wet grinding and concrete work shall be fully dry.

E. Architectural woodwork shall be allowed to come to equilibrium on site for 7 days prior to installation.

PART 2 PRODUCTS

2.1 BASIC REQUIREMENTS

A. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work.

B. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain field measurements and verify all dimensions of shop drawing details as required for accurate fit.

C. Compatibility of Grain and Color: Architect reserves the right to select materials for best compatibility between visually related members and veneers.

D. Machine and sand woodwork to comply with requirements of Standards for specified grade.

E. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.

F. Miter joints by joining, splining and gluing to comply with requirements for the specified grade.

G. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed or otherwise damaged or defective wood.

2.2 GENERAL - MATERIALS

A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Association having jurisdiction, and shall bear the official grade

and trademark of the Inspection Bureau of the Association and a mark of mill identification.

B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 062000.

C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.

D. Wood Veneers and Lumber: Provide AWI Premium Grade materials and workmanship. For species not listed in the AWS comply with the following:

1. Provide AWS Lumber Grade Premium and AWS Grade AA Veneer, book-matched, minimum 6-inch face veneer width. Kiln dry to 6-8 percent moisture content. Components shall be free of defects and sapwood. Match adjacent pieces for color and grain pattern.

2. Single-Source Requirement for Wood Veneers and Solids: Intent is to provide wood which matches as closely as possible throughout the project. Provide wood veneers and solids from the same distributor, and from the same flitches and solids sources to the greatest extent possible.

E. Lumber: AWS Section 3 with the following requirements:

1. Hardwood for Transparent Finish: Premium Grade, select species and cut to match adjoining veneers, unless otherwise shown or specified, and free from cat’s eyes, bird’s eyes, burls, curls, or cross grains.

2. Hardwood for Opaque Finish: Any hardwood which, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified.

F. Plywood: AWS Section 4; veneer core, particleboard or plywood core unless otherwise specified, and with the following requirements:

1. Hardwood: Premium Grade, face veneers as shown or specified.

2. Particleboard: Premium Grade, fire retardant for wall paneling only equal to Duraflake FR and Duraflake for cabinets. Particleboard shall be certified to meet EPP CPA 3-08 formaldehyde emission limit of 0.18 ppm, and contain no added formaldehyde resins.

3. Medium-Density Fiberboard (MDF): Conforming to ANSI A208.2, Grade 130 and ANSI MR10 moisture-resistant properties on 5/8" or thicker board. MDF shall be certified to meet EPP CPA 3-08 formaldehyde emission limit of 0.21 ppm, and contain no added formaldehyde resins.

4. Edges: Banded with hardwood in accordance with Premium Grade Standards.

G. Wood Species and Cut for Transparent Finish: Quarter sliced/sawn, species as selected by the Architect.

1. Architect's control samples for transparent finish, veneer grain and figure characteristics are available for review at the office of the Architect.

H. Veneer Matching Requirements:

1. Matching Between Adjacent Veneer Leaves: Book match and architectural end match.

2. Matching Within Individual Panel Faces: Balance and Center Match.

3. Method of Matching Panels: Blueprint-matched panels and components.

I. Finishing (Wood)

1. Transparent Finish

a. AWI Factory Finish System "Conversion Varnish, System 5, Transparent."
b. AWI Premium Grade.
c. Stain: As selected by the Architect.
d. Degree of Sheen: Dull satin.

2. Opaque Finish

a. AWI Factory Finish System "Conversion Varnish, System 5, Opaque."
b. AWI Premium Grade.
c. Degree of Sheen: Satin.
d. No grain to show.

2.3 PLASTIC LAMINATE

A. Face Sheets: NEMA Publication LD3, Grade GP50, Type I, 0.05" thick, as manufactured by Formica, Nevamar, WilsonArt. Color, pattern, and finish as selected by the Architect.

B. Backing Sheets: Non-decorative, high-pressure plastic laminate, NEMA LD3, Grade BK20, 0.02" thick.

C. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.

2.4 METAL

A. Steel

1. Structural Steel Shapes and Plates: ASTM A 36.

2. Hot-Rolled Carbon Steel Sheets: Commercial quality, ASTM A 569, may be used for concealed parts only. Galvanize sheets for planters.

B. Primer for Unexposed Metal: Zinc chromate primer.

2.5 MISCELLANEOUS PRODUCTS

A. Fasteners

1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.

2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.

3. Anchors: Type, size, material and finish as required for the condition of use.

4. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.

B. Adhesives

1. For Laminating Plastic Laminate Surfaces: Urea resin, Type II, as recommended by fabricator.

2. For All Other Uses: Polyvinyl acetate resin emulsion or other type as recommended by the fabricator.

2.6 CABINETS WITH PLASTIC LAMINATE FINISH

A. General

1. Fabricate all cabinetry and millwork to the "Premium Grade" standards of the AWS, Section 10.

2. Face construction of cabinets shall be "Flush Overlay."

3. Provide 3/4" thick doors, drawer fronts and fixed panels (including thickness of plastic) except where required to be thicker by Standards; and provide flush units.

4. Provide dust panels of 1/4" thick plywood or tempered hardboard above compartments and drawers, except where located directly below countertops.

5. Exposed Edges: Plastic laminate matching exposed panel surfaces. Ease exposed edge of overlap sheet.

B. Plastic Laminate

1. Plastic Laminate for Horizontal Surfaces: 0.050" thick, general purpose type (high pressure).

2. Plastic Laminate for External Vertical Surfaces: 0.028" thick, general purpose type (high pressure).

3. Plastic Laminate for Post Forming: 0.042" thick, post forming (high pressure).

4. Plastic Laminate for Cabinet Linings: 0.020" thick, cabinet liner (high pressure).

5. Plastic Laminate for Concealed Panel Backing: 0.020" thick, backer type (high pressure).

6. Plastic Laminate Colors and Patterns: As selected by the Architect from manufacturer’s standard satin finish products.

C. Shop Assembly: All work shall be shop assembled. Work that is too large for entrance into the use area shall be fabricated in attachable sections with provisions for reconnection in the using space.

D. Material Thicknesses: See drawings for general material thicknesses. Minimum thickness of solid lumber for web frames, trim, bases, etc., shall be 3/4". Minimum thickness of plywood and particleboard shall be 3/4".

E. Sizes: See drawings for woodwork sizes required. The manufacturer shall check field dimensions and verify all openings and actual field conditions prior to fabrication of work.

F. Manufacturer is responsible for rigidity and structural stability.

2.7 PLASTIC LAMINATE COUNTERTOPS

A. Grade: Same as AWI grade required for cabinet work; plastic laminate finish.

B. Construction

1. Provide back-splash and end-splash, where detailed; top-mounted square butt joint, fully covered with matching plastic laminate, eased edges.

2. Exposed Counter Edges: Plastic laminate matching surface, except as otherwise indicated. Ease exposed edges of overlap sheet.

3. Cut openings for equipment to be installed. Comply with equipment manufacturer's requirements, but provide internal corners of 1/8" minimum radius. Smooth saw cut and ease edges.

4. Seal cut edges of counter at openings for sinks and other "wet" equipment, using waterproofing compound recommended by plastic manufacturer and compatible with laminating adhesive.

2.8 HARDWARE

A. Architectural Woodwork Hardware: Provide the following items, or their approved equal, as required:

1. Hinges: Concealed hinges.

2. Catches: Magnetic; top and bottom.

3. Pulls: Selected by the Architect.

4. Locks: Directed by the Architect.

5. Drawer Slides

a. 24" Maximum Width: Accuride, Model 7434, full extension, 100 lb. capacity.

b. 16" Maximum Width, Easy Close: Accuride Model 3832C, full extension, 100 lb. capacity.

6. Shelf Supports: Pin and grommet system equal to No. 282.01.701 pin and 282.50.704 grommet made by Hafele.

7. Finish: Satin stainless steel.

B. Closet Hardware: Oval wardrobe rails, chrome-plated steel with center bracket and wall-support brackets made by Hafele, or approved equal.

2.9 WOOD FOR RAILINGS, CAPS, TRIM, BASES, AND FRAMES

A. Quality Standard: For the following types of interior architectural woodwork, comply with indicated standards as applicable.

1. Standing and Running Trim: AWS Section 6.

2. Miscellaneous Millwork: AWS Section 6.

B. Woodwork for Transparent Finish: Except as otherwise indicated, comply with the following:

1. Grade: Premium.

2. Species of Solid Wood: Quarter Sawn species as noted on drawings.

C. Woodwork for Paint Finish: Except as otherwise indicated, comply with the following:

1. Grade: Premium.

2. Species of Solid Wood: Solid, paint grade, sound clear Poplar or Birch.

2.10 FABRICATION - GENERAL

A. Provide lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.

B. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.

C. Coordinate the work of this Section with the work of other trades.

D. Fabricate units in largest practicable sections. Assemble in the shop for trial fit, disassemble for shipment and reassemble with concealed fasteners.

E. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.

F. Details indicate the required type and quality of construction. Modifications to conform to manufacturer’s standards will be considered provided that they comply with the Contract Documents and maintain the profiles shown, subject to acceptance by the Architect.

G. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.

H. Factory finish all items where possible. Defer final touch-up, cleaning and polishing until after delivery and installation.

I. Comply with AWI, Premium Grade, for sanding, filling countersunk fasteners, back priming and similar preparations for the finishing of architectural woodwork, as applicable to each unit of work.

J. Prepare all countersunk wood screw attachments for wood plugs. Wood plugs shall match surrounding species and grain direction; putty filling is not acceptable.

2.11 FABRICATION - SPECIFIC ITEMS

A. Millwork

1. Include all preparations for mechanical, electrical, telephone and plumbing work required.

2. Provide cabinet hardware for millwork as shown.

3. Provide dust panels in body webs and between drawer units.

4. Provide wood veneers for exposed surfaces as specified herein before.

5. Hollow core doors will not be permitted.

6. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified.

7. Provide drawers with slides as specified. Drawers shall not rest on web body frames.

8. Provide wood veneers for transparent finish, of matching and continuing grain, for drawer and door edges.

B. Closet and Storage Shelving

1. Provide closet and storage shelving in accordance with AWI, Custom Grade, unless otherwise shown or specified.

2. Exposed edges shall have hardwood edge bands.

C. Standing and Running Trim: Provide standing and running trim of the sizes, profiles, species and finish as specified or shown and complying with AWI Section 6, Premium Grade.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 FRAMING

A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.

B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

3.3 GROUNDS, BLOCKING, NAILERS, AND FURRING

A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 ROUGH HARDWARE

A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.

B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, power-driven fastenings, or other suitable devices may be used where approved by the Architect.

C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.5 INSTALLATION OF CABINET FINISH HARDWARE

A. All items of finish hardware furnished under this Section shall be carefully fitted and secured in place as part of the work of this Section. Locations and positioning of hardware shall be subject to the Architect’s approval. Care shall be taken not to mar or damage hardware, or other work. Install doors plumb and true. Hardware shall be fitted to assure operation without forcing.

B. After preliminary fitting of hardware, the Contractor shall remove trim for painting and finishing work; after which he shall reinstall the hardware in a permanent manner.

C. Upon completion of the work, before final acceptance of the building by the Owner, the Contractor shall, in the presence of the Architect, show that all hardware is in satisfactory working order; fit all keys in their respective locks and, upon acceptance of the work, shall tag and deliver all keys to the Architect and Owner.

D. When directed by the Owner, at any time during the first year after the completion of the Contract, the Contractor shall return to the building and adjust and refit the work and hardware, and leave such items in satisfactory working order.

3.6 GENERAL INSTALLATION

A. Wall anchorage and general installation procedures for cabinetry work shall conform to AWS Section 10, Article entitled "EXECUTION," Sub-Article 6.1, with all related sub-paragraphs.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.7 WOOD TRIM

A. Install with minimum number of joints possible, using full-length pieces for each run. Stagger joints in adjacent and related members. Cope at returns, miter corner.

B. Joints of all trim and/or moldings shall be set tight, miter exterior angles and cope interior angles. Joints, except end joints less than twelve (12) feet apart, will not be permitted in straight runs of trim and/or moldings.

C. Secure all trim and/or moldings with glue and blind nail with finishing nails. Set exposed nail heads in finished work and putty. Sand all work to remove any tool marks and irregularities.

D. Wood shall receive finish as specified in Section 099000, "Painting and Finishing."

3.8 WOOD HANDRAILS

A. Wood shall be planed straight, square and level, then sanded smooth with flush finished surfaces. Joints shall occur over supports. Right angle joints shall be mitered.

B. All exposed fastening devices shall be countersunk and set below finished wood surfaces, and fitted with matching wood plugs; sand plugs and finish smooth and flush with exposed surfaces.

C. Provide all hardware and metal supports required for complete installation as detailed on drawings.

3.9 CLOSET AND STORAGE SHELVING

A. Provide closet and storage shelving at the locations shown. Provide hang rods where shown. Set adjustable center hangers.

3.10 CABINET WORK AND MILLWORK

A. General

1. Materials and workmanship shall conform to the Quality Standards of the Architectural Woodwork Institute specified herein and to the drawings.

2. Cabinet work and millwork shall be performed by an experienced cabinet work and millwork company, having craftsmen skilled in their trade.

3. Fabricate all cabinet work and millwork completely in the shop, in complete and/or as large units as practical, leaving only fitting, assembly, installation and a minimum of fabrication and finishing to be done at the building. Assembled work shall be rigidly secured and permanently fastened together with concealed fasteners.

4. Afford Architect every facility for inspection of work at shop or mill at such times as the Architect may select.

5. As far as practicable, use concealed fastenings for joining and assembling the work. Where this is impossible, the means of securing shall be placed in inconspicuous places and methods of joining and assembling submitted for Architect’s approval prior to fabrication.

6. Mill all finish wood accurately to detail, with clean cut moldings, profiles and lines, machined, sanded smooth, housed, jointed, blocked, put together in the best manner, with provision for swelling and shrinkage, and to assure the work remaining in place without warping, splitting or opening of joints.

7. Cut trim to dimensions and profiles shown, from solid stock.

8. Make all trim and the like in single lengths wherever possible; joints mitered, glued and splined. Continuous members shall have tight flush joints, doweled or splined and glued.

9. Make all joints hairline tight, fitted accurately and joined with hardwood splines or dowels, glued together, or by other method approved by Architect. Use screws, not nails, for fastenings.

10. Gluing shall, where practicable, be by the hot plate press method and glued surfaces shall be in close contact throughout. Glue stains on finished work will not be permitted.

11. Cover surface fastenings, where permitted, with matching wood plugs or wood putty. Finish exposed edges of plywood with matching solid stock. Lock miter external corners; tongue and groove internal corners to allow for contraction and expansion.

12. Machine sand with grain, finish with hand sanding, leave exposed surfaces free from machine or tool marks that will show through the finish.

13. Work which adjoins drywall, concrete, or other finish shall be fitted and scribed in a careful manner and ample allowance shall be given for cutting and scribing.

14. Erect work true to lines, levels and dimensions, square, aligned and plumb, securely and rigidly fastened in place.

B. Cabinet Work: Provide all items of cabinet work indicated on drawings and as herein specified.

1. Tops, sides, backs, bottoms, dividers, shelves, fronts, doors and drawer fronts shall be of plywood or flakeboard core, with the specified wood veneer or plastic laminate as indicated on drawings.

2. Drawer sides and backs shall be 1/2" thick solid clear selected white birch, suitable for clear finish. Drawer bottom shall be 3/8" thick plywood with clear selected white birch veneers, suitable for clear finish.

3. Cabinet doors and drawers shall be flush mounted.

4. Adjustable shelves in cabinets shall have grommets spaced 2" o.c.

5. Fixed shelves shall be dadoed into side supports and glued.

6. Shelves shall be 3/4" thick for spans up to 30"; for spans in excess of 30" to 48" shelves shall be 1" thick.

7. All cabinets shall have closed top, sides, bottom, and back with veneers to match face work. Cabinets to fit accurately into indicated locations; scribe moldings permitted only where indicated.

8. Countertops, counters, counter fronts, shelves, etc., indicated on drawings to have plastic laminate, shall have plastic laminate shop applied to 3/4" thick core, with plastic laminate backing sheet on underside or back of countertops, counters and shelves. Plastic laminate shall be pressure laminated to core with laminate at external corners. Provide concealed wood framing to support plastic laminate counters, securely fastened to wall and to underside of counters.

C. Countertops shall be installed to support a minimum concentrated live load of 150 lbs. acting downward at mid span at outer edge of counter without causing deformation and damage.

3.11 WOOD BASES

A. Provide plywood backing, toggle bolted to substrate, if substrate not suitable for securing wood base.

B. Machine wood bases from specified wood, to profiles indicated on drawings.

C. Set base level and plumb. Where indicated on drawings, face of wood base shall be flush with wall above. Glue wood base to substrate or to plywood backing, and screw or nail wood base to substrate or to plywood backing with countersunk wood screws or

with finishing nails, recess wood screw heads, and spackle with wood putty, set and spackle nails with wood putty. Do not nail or fasten wood base to floor. Ends of wood base shall be either splined or shiplapped.

D. Where no wood backing occurs, screw apply base at each stud with screw countersunk and wood putty applied and sanded smooth and flush with base.

3.12 PAINTING AND FINISHING

A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be by painting Subcontractor, as specified for in Painting Section.

B. Back-Painting: All work of this Section in contact with concrete or masonry or other moisture areas and all concealed surfaces of cabinet and millwork, shall be back-painted with one (1) coat of oil-based paint prior to installation, shop applied where practicable.

C. Field Touch-Up: Field touch-up shall be the responsibility of the installing Subcontractor and shall include the filling and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

3.13 CLEAN UP AND PROTECTION

A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.

B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

END OF SECTION 064023

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 06 41 00

CUSTOM CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide casework, cabinets and shelving as indicated on the Drawings and as specified herein. All casework shall have wood finish except where laminate cladding is indicated on the Drawings.

1.2 SUSTAINABILITY REQUIREMENTS

A. Sustainability requirements included in the Section are as follows:

1. Restrictions on the use of urea-formaldehyde containing materials.

2. All MDF, High Pressure Decorative Plastic Laminates (HPL), and particleboard products must have a industry wide (generic) or product specific Environmental Product Declaration (EPD). EPD must conform to the following standards: ISO 14025, 14040, 14044 and EN 15804 or ISO 21930

1.3 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

1. Architectural Woodwork Institute (AWI):
   Architectural Woodwork Quality Standards

2. ASTM International (ASTM)

3. American National Standards Institute (ANSI):
   ANSI 156.9 B43161, ANSI A208.1

4. International Organization for Standardization (ISO)

5. European Standards (EN)

6. National Electrical Manufacturers Association (NEMA):
   NEMA LD3 High-Pressure Decorative Laminates

7. American Wood Preservers' Association (AWPA).
   Standard UC1

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each product and process specified as work of this Section and incorporated into items of the casework.

B. Manufacturer’s AWI Certifications: Submit casework manufacturer's (fabricator's) certification, stating that fabricated casework complies with AWI quality grades and other requirements indicated herein.

C. Wood Treatment Data: Submit chemical treatment manufacturer's instruction for handling, storing, installation, and finish of treated material.

D. Fire-Retardant Treatment: Certification by treating plant stating treated material complies with AWPA specified use category UCFA standards and treatment will not bleed through specified finishes.

E. Hardware (for each type): Name, manufacturer, type, style, size, function, finish, and information about fastenings.

F. Shop Drawings: Submit Shop Drawings showing location of each item, dimensioned plans and elevations, large-scale details and profiles, attachment devices, hardware and other components.

1. Identify casework using same identification system shown on Architectural Drawings.

2. Coordinate details and cut-outs to accommodate accessories and work specified under other Sections.

G. Samples: Submit the following samples representative of quality to be provided in finished work:

1. Wood trim, 12" length by specified width of each type and finish.

2. Hardwood veneer plywood.

3. Plastic laminate, 8" x 10" for each type, color, pattern and surface finish.

4. Hardware, one of each type and finish of each item to be used.

5. Counter tops and exposed shelving, 12" x 12" with wood edge and/or laminate edge as shown.

6. Quartz agglomerate simulated stone countertop, 6”x6”. Sample for each color/pattern selected. Sample shall include a seam if project includes tops more than 10 feet long.

7. Stain Colors for selection

8. One Unit of Cabinet Work Each Shipment (If Requested)

H. Name of Cabinet Mfr/Fabricator of cabinetwork

I. Low Emitting Materials Compliance Submittals

1. Provide documentation for each adhesive to be used on site, indicating that the adhesives comply with low V.O.C. requirements as stated above under 'Sustainability Requirements.'

J. Sustainability Submittals

1. Submit manufacturer's documentation that composite wood products, including plywood, that are used are manufactured without the use of any added urea-formaldehyde. This requirement includes binders, and laminating adhesives used in the field or shop. Submit manufacturer's documentation of the resin used in lieu of urea-formaldehyde in binders and laminating adhesives.

2. Submit generic or product specific EPD or Product Specific Declaration for MDF, High Pressure Decorative Plastic Laminates (HPL), and particleboard products.

1.5 QUALITY ASSURANCE

A. AWI Quality Standard: Comply with applicable requirements of the AWI "Architectural Woodwork Quality Standards", except where indicated otherwise.

B. Fabrication and Installation Qualifications: firm which can demonstrate a minimum of 5 years of successful experience in fabricating and installing casework items similar in type and quality to those required for this project.

C. Submit name of firm to the Owner for approval.

D. The Owner reserves the right to select at random one unit of cabinetwork in each shipment and to dismantle and examine it for determination of compliance with the Specifications.

If, after examination, it is found that the unit does comply, the cost of the replacement unit will be paid for by the Owner. If, after examination, it is found that the unit does not comply, the entire shipment shall be removed from the Project Site and cabinetwork complying with the Specifications shall be provided. Expense of removal and replacement shall be borne by the Contractor.

E. Obtain each type of hardware from a single manufacturer.

F. Fire-Retardant Treated Material: Accredited testing agency mark on each piece of wood indicating compliance with the fire hazard classification.

G. All plywood, composite wood products and laminating adhesives used shall contain no added urea-formaldehyde.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect casework during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework, until operations which could damage, soil or deteriorate casework have been completed in installation areas. If casework must be stored, store only in areas meeting requirements specified for installation areas.

1.7 PROJECT CONDITIONS

A. Casework Manufacturer and Installer shall advise the Owner's Representative of temperature and humidity requirements in writing for casework installation and storage areas. Do not install casework until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and required temperatures and relative humidity have been stabilized.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within 1.0 percent of optimum moisture content as follows:

1. Optimum Moisture Content of Wood: 5-10%

2. Relative humidity required to be maintained in installation and storage areas: 25-55%

1.8 COLOR SELECTIONS

A. Stain colors and plastic laminate colors, patterns and textures: selected by the Project Architect from manufacturer’s standard colors.

PART 2 – PRODUCTS

2.1 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber and plywood at time of fabrication and for relative humidity in installation areas.

B. Fabricate casework to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.

C. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowances for scribing, trimming, and fitting.

D. Pre-Cut Openings: Provide casework with pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts and, where located in countertops, seal edges of cutouts with a water-resistant coating.

E. Measurements: Before fabrication of casework to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.

1. Where field measurements before fabrication would delay the project, fabricate without field measurements and provide ample borders and edges to allow for scribing and trimming of casework.

F. Cabinet work and paneling construction shall comply with the requirements of AWI Architectural Cabinets and Paneling, Premium Grade, except where indicated herein and on the Drawings for more stringent requirements.

G. All plywood, composite wood products and laminating adhesives used shall contain no added urea-formaldehyde.

2.2 WOOD SPECIES AND GRADES

A. Solid Wood and Hardwood Veneer Plywood

1. Where exposed to view, interior finish throughout Building, except as indicated in 2. below, and except as indicated otherwise on the Drawings: Plain Sawn Red Oak, AWI Grade A1.

2. Plywood not exposed to view (tops and backs): AWI Grade B2.

3. Grain appearance: Running match; grain consistent for each cabinet.

4. Provide same species of veneer on both sides of plywood.

5. Shelving in Cabinets (exposed) and Backs of Open Book Shelves and Magazine Racks: Plain Sawn Red Oak, AWI Grade A1 for Oak Units; White Birch, AWI Grade A1 for Birch units. Solid wood shelving edge (Oak or Birch, to match cabinet species).

6. Shelving in Cabinets (unexposed): White or Red Birch, AWI Grade B2, with solid wood edge (Oak or Birch, to match cabinet species).

7. For all laminated cabinet/counter tops with sinks, and including the full sub-top beneath solid surfacing countertops: AWI grade B2 sanded plywood.

2.3 TYPES OF PANELS

A. Particleboard: High density grade H-1(min 50 pounds per cubic foot) for plastic-laminate countertops. Particleboard shall not be permitted for shelving or support legs for countertops.

B. Particleboard core plywood: medium density particleboard core, with face and back veneers and cross bandings (5-ply). Use only for drawer sides or where covered by laminate. Not permitted for shelving.

C. Veneer Core Plywood: core of odd number of veneer plies, with face and back hardwood veneers. Use veneer core plywood for all other casework.

2.4 TEMPERED HARDBOARD

A. Manufacturers

1. Masonite Corp. Towanda, PA 18848
2. Lousiana-Pacific Corp. Neenah, WI
3. Forestex Co. Division of Stimson Lumber Forest Grove, OR

B. Type: solid or perforated (holes spaced evenly at 1" o.c. in both directions, with even borders around edges), as indicated on the Drawings.

C. Thickness: as indicated on the Drawings.

2.5 HIGH PRESSURE DECORATIVE PLASTIC LAMINATES

A. Manufacturers

1. Formica Corp.
2. Wilsonart LLC.
3. Panolam Surface Systems – Nevamar, Pionite decorative surfaces

B. Adhesives: as recommended by plastic laminate manufacturer.

2.6 GENERAL NOTES

A. Provide 24 gage stainless steel channel edging strips for exposed edges for sink top and splash back unless otherwise indicated. See Drawing Details. Provide plastic laminate covered splash backs at sides of sink cabinets where they abut walls, cabinets, and at other abutments. Where sink top is quartz agglomerate provide splash backs of quartz agglomerate.

B. Certain cabinets shall have stainless steel channel edging. Tops of movable units shall have hardwood edges securely glued to plywood as indicated on the Drawing Details.

C. Provide continuous neoprene and aluminum weather-stripping at top, bottom and hinge side of door openings and on edge of one door of each metal lined cabinet in shops of Intermediate and High Schools where indicated on Drawings. Weatherstripping at top, bottom and hinge side of door openings shall be Catalog No. 50M; weather-stripping at edge of door shall be Catalog No. 53M, both as manufactured by Zero Weatherstripping Company, Inc. or equivalent by Reese Enterprises Inc. Weatherstripping on meeting edge shall be let into door as indicated on Details.

D. Provide the tempered hardboard materials for sliding doors and backs of certain cabinets at locations indicated on the Drawings. Doors and backs of certain cabinets shall be perforated or solid tempered hardboard of thickness indicated.

E. Provide birch shelf cabinet in Helps' locker rooms. Top shall be covered with plastic laminate as specified herein, finished with stainless steel edging. See Drawing Details.

F. Provide the steel plates for tapered wood legs at movable storage cabinets. See Drawing Details.

G. All book cabinets, book and magazine racks and all other cabinets shall be provided under this Section of the Work in accordance with Detail Drawings.

H. Exposed edge treatment not otherwise specified: Solid wood matching face for species and cut.

I. Where structural columns occur between cabinets in line, wood paneling or cabinet shall be carried across the face of column same height as adjoining cabinet groups, where so indicated on the Drawings.

2.7 ARCHITECTURAL CABINETS - LAMINATE CLAD

A. Comply with AWI requirements for Section 10 4.2.8 Laminate Clad Cabinets, Premium Grade.

B. Laminate Cladding: High pressure decorative laminate complying with the requirements of AWI Section 4 4.2c and minimum test procedures and requirements of NEMA LD3:

1. Colors, Finishes, Patterns: as selected by the Project Architect.

2. Surfaces, Grades and Thicknesses:

a. Horizontal surfaces other than tops: HGS, nominal thickness 0.048".
b. Tops: HGS, nominal thickness 0.048".
c. Post-formed Surfaces: Horizontal HGP, nominal thickness, 0.039".
d. Post-formed Surfaces: Vertical VGP, nominal thickness, 0.028”
e. Vertical Surfaces: VGS, nominal thickness 0.028".
f. Edges: nominal thickness 0.048".

C. Surface Material of Panels

1. Exposed surfaces (other than edges): Grade II.

2. Semi-Exposed surfaces (other than edges): Grade III.

3. Edges: Grade II.

D. Types of Panels

See Article. 2.3.

E. Wood Laminate Grains

1. Long direction of panel, unless indicated otherwise on the Drawings.

F. Grades of Semi-exposed Components

1. Comply with AWI Section 10 4.2.8.3, Premium Grade, unless indicated otherwise on the Drawings.

G. Materials and Minimum Thickness for Cabinet Components

1. Body members: Panel: 3/4"
2. Rails: Panel or Lumber: 3/4"
3. Shelves: Veneer Core Plywood Panel:

3/4" for spans to 39"
1" for spans 39" to 48"

4. Backs: Panel: 1/2"
5. Drawer Sides: Particleboard core plywood Panel: 1/2"
6. Drawer Bottoms: Veneer Core Plywood:
   For bottoms 12" wide or less: 1/4"
   For bottoms 12" to 30" wide: 3/8"
   For bottoms over 30" wide: 5/8"
7. Drawer Fronts: Panel: 3/4"

H. Core materials and Thickness for Hinged Cabinet Doors

1. Particleboard core plywood: Thickness dependent on size of door
2. For doors 30" width, 60" height: 3/4"
3. For doors 36" width, 72" height: 1"

I. Core Materials and Thickness for Sliding Cabinet Doors

1. Particleboard core plywood: Thickness dependent on size of door:

Minimum	Thickness of Door	Maximum Width	Size Height
Top Suspension	3/4"	30"	72"
Bottom Track	3/4"	24"	32"
Top Suspension	1" to 1¼"	36"	84"
Bottom Track	1" to 1¼"	30"	36"

J. Edge Treatment of Exposed and Semi-exposed Components

1. Body Members and Shelves: Match face laminate
2. Doors: Match face laminate.
3. All edges: HDPL, banded; pressure-glued.

K. Construction: Comply with the following AWI requirements:

1. Drawer Construction: AWI Section 10 4.4.26.2.
2. Joinery and Case Body Member Fastening: Comply with AWI Section 10 4.4 Standards for Premium Grade.

2.8 CABINET TOPS

A. Comply with the requirements of AWI Section 10 4.4.9, for Premium Grade.

B. Solid Laminated Wood Tops

The tops of cases and counters, when built up, shall be grooved and splined and glued or other approved method of joining, cleated on underside where so shown, secured in place with concealed screws and washers, hand scraped and left perfectly true and smooth.

Length in one piece: 10'

Thickness of Top: $1^{1}/_{8}$" minimum

C. High Pressure Decorative Laminate Tops

Width: if exceeds 60", shop assembled.

Length in one Piece: 12'

Thickness of Top: 3/4" minimum.

Balancing Sheet Requirements: Standard 0.02" backup sheet wherever unsupported area exceeds 4 sq. ft. and core is 3/4" thick; 6 sq. ft. and core is 1" thick; 8 sq. ft. and core is $1^{1}/_{8}$" thick or thicker.

2.9 FIXED PANELS

A. Wood paneling areas adjacent to cabinetwork and paneling at walls in other areas:

1. Comply with the requirements of AWI Section 6 Premium Grade.

2. Wood Species: Plain Sawn Red Oak, AWI Grade A1.

2.10 FIRE-RETARDANT TREATMENT

A. Where lumber is indicated or required to be fire-retardant treated, provide "UCFA" lumber, complying with AWPA Standards for pressure impregnation with fire-retardant chemicals to achieve a flame spread rating of 25 or less, when tested in accordance with UL Test 723, ASTM E84 or NFPA Test 255.

1. Where treated items are indicated to receive a transparent or paint finish, use a fire-retardant treatment which will not bleed through or adversely affect bond of finish.

2. Provide UL label or identifying mark on each piece of fire-retardant lumber.

3. Redry treated items to maximum moisture content of 19 percent after treatment.

B. Fire-retardant Treated Plywood

Comply with APA requirements.

2.11 CASEWORK TYPES

A. Bookcases and Miscellaneous Cases and Cabinets

Bookcases, cabinets, special cabinets, and other casework and cabinets shall be provided in all rooms where so indicated on the Drawings or specified herein.

Provide all doors, cupboards, drawers, counters and shelves, hardware and other accessories and components in connection therewith.

B. Restroom Lavatory Countertops: See 066616 'Solid Surfacing Fabrications'

2.12 HARDWARE - GENERAL

A. Manufacturers

1. Cylinders for Drawers, and Book cabinets
   a. Sargent
   b. Corbin Russwin
2. Cabinet Hardware
   a. Ives
   b. Stanley
3. Door Pulls
   a. Ives
   b. Stanley
4. Drawer Pulls
   a. Ives
   b. Stanley
5. Drawer Slides
   a. Grant
   b. Knape & Vogt
6. Hinges
   a. Ives
   b. Stanley
   c. Lawrence
   d. McKinney
7. Shelf Standards and Supports
   a. Knape & Vogt
   b. Parker
8. Elbow Catch
   a. Ives
   b. Knape & Vogt
9. Sheaves for Sliding Cabinet Doors and Sliding Cork Display Boards
   a. Knape & Vogt
   b. Grant
10. Bottom Track for Sliding Cabinet Doors and Sliding Cord Display Boards
    a. Knape & Vogt

b. Grant
c. Stanley

11. Top Track for Sliding Cabinet Door
    a. Knape & Vogt
    b. Grant
    c. Stanley

12. Finger Pull for Sliding Hardboard Door
    a. Knape & Vogt
    b. Ives

13. Flush Pull for Sliding Cabinet Door
    a. Ives
    b. Rockwood

14. Coat, Hat and Umbrella Hooks
    a. Ives
    b. Stanley
    c. Rockwood

B. Screws

1. Secure hardware with suitable screws and bolts of same material and finish as hardware items unless otherwise specified. Provide Phillips head screws unless otherwise indicated.

2. Manufacturer of each hardware item shall provide the fastenings required for the installation of that item.

C. Hardware Finish

Hardware finishes including the following shall comply with requirements of ANSI/BHMA standards:

BHMA Code	Description	Base material	U.S.Standards equivalent
605	Bright Brass	Brass	US3
625	Bright Chromium	Brass or Bronze	US26
626	Satin Chromium	Brass/Bronze base	US26D
629	Bright Stainless Steel	Stainless steel	US32
630	Satin Stainless Steel	Stainless steel	US32D

2.13 HARDWARE REQUIREMENTS

A. Pin Tumbler Cylinder Lock for Drawers in Tables, Book Cabinets, Bookcases, Supply Cabinets, and other locations indicated:

Bronze.

B. Pin Tumbler Cylinder Lock for Doors in Book Cabinets, Bookcases, Supply Cabinets, and other locations indicated.

Cast bronze lock, size 2" x $1^{5}/_{8}$", with 3/16" x 7/8" bolt of not less than 1" throw, Sargent 1655.

Lock for Sliding Doors shall be cylinder push lock.

C. Cylinders

Cylinders of locks shall be of proper length to fit doors or drawers for which they are intended. Cylinders shall be solid brass with common standard diameter rotating plug. The keyway shall be paracentric type of single section with seven pins or multiple (four or more) sections with six pins capable of being masterkeyed and grand masterkeyed as specified without duplications or interchanges.

D. Magnetic Catches

For doors over 3'-0" in height: Aluminum Case. Dual triple pole with self-aligning magnets. Conform to ANSI 156.9 B43161. Ives Heavy Duty Magnetic Catch No. 327.

For doors 3'-0" and under in height: Aluminum Case. Dual double pole with self-aligning magnets. Conform to ANSI 156.9 B43161. Ives Heavy Duty Magnetic Catch No. 326.

E. Elbow Catch on Inactive leaf of Doors Under 3'-0" in Height

Cast brass elbow catch with spring on plate not less than 2½" x 1", strike plate not less than 1½" x 1/2", six screws. Conform to ANSI 156.9.

F. Hinges for laminate clad doors with particleboard cores

Provide Blum Modul Series hinges as manufactured by Julius Blum Inc. or equivalent by Sugatsune America Inc. Provide quantity of hinges for door size and weight as recommended by the hinge manufacturer, as a minimum. Provide at least 3 hinges for doors less than 5'-0" and at least 4 hinges for doors between 5'-0" and 6'-0".

G. Door to Bookcases and Supply Closets

Solid standard pattern cast-bronze pull with clear finger space 3½" x 7/8". weight not less than 3½ ounces, secured with 4 screws.

H. Drawer Pulls

Approved cast-bronze, secured by two concealed screws. Clear finger space not less than 11/16" x $2^{5}/_{8}$", and $4^{1}/_{8}$" over all. Weight not less than 2 ounces. Unless otherwise specified, provide two pulls for drawers 20" wide or over and one pull for drawer less than 20" wide.

I. Slides: Powder coated metal slides, 100 lb. rating, bottom mount with self-closing action. All drawers to open to three-fourths of the drawer length.

J. Cabinet Shelf Rests

Rests shall be of gray-plate metal supported by gray plate metal standards. Four (4) rests for each shelf. Provide rests for adjustable wood and metal shelves in cases and cabinets indicated on Drawings.

K. For Glass SS Shelves and Free Standing Adjustable Shelving to conform to ANSI/BHMA A156.9

Knape & Vogt 186-187 Heavy-Duty Brackets, Type 304 stainless steel.

Knape & Vogt 87 Heavy-Duty Standards, Type 304 stainless steel installed in accordance with manufacturer's installation instructions.

Adjustable shelving on pegboard shall be as part of work of Section 06200.

L. Screw Hooks for Umbrellas

Ives No. 581 MB Satin Chromium for umbrella hooks in Teachers' closets or wardrobes.

M. Hardware for Doors in Tables, Cases, Cabinets

1. Hardware for doors to display cases and display cabinets in corridors indicated on Drawings are provided with cases or cabinets. See Section 10415.

2. Butts for cabinet doors: Wrought Bronze, 3" x 3" fast pin for 1¼" doors, 3" x 2½" fast pin for $1^{1}/_{8}$" doors, 2½" x 2½" butts for small doors under counter shelves in cupboards, and 2" x 2" butts for 13/16" doors.

3. Hinges for laminate clad doors with particle board cores shall be Blum Modul Series by Julius Blum Inc. or equivalent product by Sugatsune America Inc. Provide number of hinges for door size as recommended by hinge manufacturer, as a minimum. Provide at least 3 hinges for doors less than 5'-0" and at least 4 hinges for doors between 5'-0" and 6'-0".

N. Doors for Cabinets Over 3'-0" in Height

Fast Pin Wrought Bronze Butts shall be 3" x 2½" and 3" x 3", 0.092 gage. Each hinge shall have 6 screws. Provide 4 butts for doors 5'-0" to 6'-0" in height, 1¼" thick or less.

Pin tumbler cylinder lock for bookcases, book cabs, and supply cabinets: Cast bronze lock, size 2" x $1^{5}/_{8}$", with 3/16" x 7/8" bolt of not less than 1" throw, Sargent 1655.

Pulls shall be solid standard pattern cast-bronze pull with clear finger space 3½" x 7/8", weight not less than 3½ ounces, secured with 4 screws.

Surface bolts shall be Ives No. 054, 4" long at top and bottom of inactive leaf of double doors. Approved magnetic catch at top or bottom of doors.

O. Small Cupboard Doors, Doors under Counter Shelves, Counters including Storage Cabinets at Science Room and Prep Room Windows

Fast Pin Wrought Bronze Butts, 3" x 2½" and 3" x 3", 0.092 gage. Each hinge shall have 6 screws. Lock: Cast bronze locker lock, size 2" x $11^{5}/_{8}$", with 3/16" x 7/8" bolt of

not less than 1" throw, Sargent 1655. Lock for Sliding Doors shall be cylinder push lock.

Ives Elbow Catch No. 2 MB-Satin Chromium finish at top or bottom of inactive leaf of double doors, approved knob pulls, approved magnetic catch at top or bottom of active doors.

P. Sliding Cabinet Doors in Wood Frames

Two (2) 400A Knape & Vogt sheaves, top track, Knape & Vogt 467 bottom track for each pair doors, Ives No. 22 flush pulls.

Q. Hinged Doors for Wall Cabinets over Sinks

Fast Pin Wrought Bronze Butts, 3" x 2½" and 3" x 3", 0.092 gage. Each hinge shall have 6 screws. Magnetic catch, no knobs or locks required.

2.14 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

2.15 FACTORY FINISHING

A. Finish for Wood Cabinetwork: Comply with AWI Section 5- Factory Finishing System #11 Catalyzed Polyurethanes, Satin-medium rubbed sheen, as follows for Premium grade:

Oak: Filler, washcoat, stain, sealer, sand (220 grit stearated paper), topcoat.

Birch and Maple (and other closed grain woods): washcoat, stain, sealer, sand (220 grit stearated paper) topcoat.

2.16 KEYING FOR CABINETWORK

A. All casework/millwork – doors and drawers shall have locks and keys.

B. All casework/millwork in a room shall be individually keyed, mastered by room and grand mastered.

C. Provide three (3) keys for each lock and three (3) master keys.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine all areas to receive Work of this Section and correct conditions as required to accommodate the Work.

B. Do not deliver and install Work of this Section until wet work such as plastering, painting and other finishes is completed; the HVAC system shall be operating and maintaining proper temperature and humidity conditions.

C. Condition cabinetwork and paneling to the average ambient humidity conditions prior to installation.

D. Verify the location and condition of concrete inserts, and other built-in anchoring devices.

3.2 INSTALLATION

A. Install cabinetwork and paneling plumb, true, level and without distortion. Shim as needed with concealed wood or hard plastic shims.

Tolerances: 1/8" in 8'-0" for plumb and level (including tops); allow no variation in flushness of adjoining surfaces.

B. Scribe and cut cabinets, paneling, and tops to fit adjoining Work. Refinish cut surfaces to match adjacent surfaces; repair damaged finishes.

C. Provide filler strips; trim strips to irregularities of adjacent surfaces.

D. Secure and anchor fixed cabinetwork to substrates with concealed devices and fasteners of sufficient sizes and strengths to support fully-loaded cabinets.

E. Anchor tops to cabinets and supports with concealed fasteners.

F. Full sub-tops for quartz agglomerate sink counters shall be flat, level, and completely supported.

G. Secure paneling to substrates or supports with concealed fasteners, where possible; where nails are required, use countersunk finishing nails.

H. Adhesives used in field assembly shall comply with restrictions for V.O.C.s.

3.3 HARDWARE INSTALLATION

A. Secure hardware with screws, bolts and fasteners of the proper sizes, with finish to match hardware.

B. Secure hardware to metal with suitable tap screws.

C. Shop install hardware.

3.4 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Adjust cabinetwork units as required for proper and uniform appearance.

B. Clean and lubricate hardware; adjust hardware for proper operation.

C. Clean woodwork and glasswork on both exterior and interior surfaces.

D. Touch-up shop-applied finishes where damaged or soiled, to obtain a finished appearance to match that of adjacent surfaces. If not possible to obtain a suitable finish, provide a new surface or component.

3.5 CLEANING AND ADJUSTING

A. Clean hardware items thoroughly and adjust for proper operation.

3.6 KEY OPERATION AND INSPECTION

A. Upon completion of the building and after locks have been secured in proper positions, keys belonging thereto shall be fitted and made to work freely in respective locks in the presence of the Owner's Representative.

END OF SECTION 064100

SECTION 06 61 16

SOLID SURFACING FABRICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide solid surfacing fabrications including but not limited to following:

1. Window sills.
2. Lavatory or laboratory tops with seamed bowls.
3. Millwork counter tops with sinks and cove backsplashes.

B. Related Sections: Following description of work is included for reference only and shall not be presumed complete:

1. Provision of finish carpentry and architectural woodwork: Section 064023, Architectural Woodwork.
2. Provision of elastomeric joint sealants: Section 079200, Joint Sealants.
3. Provision of tile work: Section 093013, Ceramic Tiling.
4. Provision of plumbing and plumbing fixtures: Division 22, Plumbing.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. MDF: Medium Density Fiberboard.
2. SCAQMD: South Coast Air Quality Management District; www.aqmd.gov.
3. VOC: Volatile Organic Compound.

B. Definitions:

1. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

C. Reference Standards:

1. ANSI/NPA A208.2-09
   - Medium Density Fiberboard (MDF) For Interior Applications
2. ASTM C920-14a
   - Standard Specification for Elastomeric Joint Sealants
3. ASTM D638-10

- Standard Test Method for Tensile Properties of Plastics

4. ASTM D785-08
   - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials

5. ASTM D790-10
   - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

6. ASTM D5420-10
   - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

7. ASTM E84-14
   - Standard Test Method for Surface Burning Characteristics of Building Materials

8. ASTM E228-11
   - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer

9. ASTM G21-13
   - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

10. ASTM G22-76(96)
    - Standard Practice for Determining Resistance of Plastics to Bacteria

11. ASTM G155-13
    - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

12. NFPA 255-06
    - Standard Method of Test of Surface Burning Characteristics of Building Materials

13. SCAQMD Rule 1168
    - Adhesive and Sealant Applications (amended January 2005)

14. UL 723
    - Standard for Test for Surface Burning Characteristics of Building Materials

15. UL Environment/ GREENGUARD UL 2818 - Standard for Chemical Emissions for Building Materials, - Finishes and Furnishings, Section 7.1

16. UL Environment/ GREENGUARD UL 2818 - Gold Standard for Chemical Emissions for Building Materials, - Finishes and Furnishings, Section 7.1 and 7.2

17. UL 2824 - GREENGUARD Certification Program, Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Arrange preinstallation meeting 1 week prior to commencing work with all parties associated with trade as designated in Contract Documents or as requested by Architect. Presided over by Contractor, include Architect who may attend, Subcontractor performing work of this trade, Owner’s representative, testing company's representative and consultants of applicable discipline. Review Contract Documents for work included under this trade and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of work of this Section.

1.4 SUBMITTALS

A. Product Data: Indicate Product description including solid surface sheets, sinks, bowls and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. Submit Product data with resistance to list of chemicals.

B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 014000. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.

C. Coordination Drawings: Submit coordination drawings indicating plumbing and miscellaneous steel work indicating locations of wall rated or non-rated, blocking requirements, locations and recessed wall items and similar items.

D. Samples: Submit samples in accordance with Section 014000. Submit minimum 6" x 6" samples. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

E. Test and Evaluation Reports: Submit flammability test reports

1.5 CLOSEOUT SUBMITTALS

A. Operational and Maintenance Data:

1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in Project closeout documents.

2. Provide a commercial care and maintenance kit and video. Review maintenance procedures and warranty details with Owner upon completion.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Provide work of this Section executed by competent installers with minimum five (5) years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

B. Storage and Handling Requirements:

1. Store components indoors prior to installation.

2. Handle materials to prevent damage to finished surfaces.

1.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of ten (10) years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer List: Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

1. Corian by DuPont; www.corian.com

2. Samsung Chemical USA; www.staron.com

3. Wilsonart Contract; www.wilsonartcontract.com

B. Substitution Limitations: This Specification is based on Corian® Products. Comparable Products from manufacturers listed herein will be accepted provided they meet requirements of this Specification.

2.2 MATERIALS

A. Description:

B. Performance/Design Criteria:

Property	Requirement (min or max)	Test Procedure
1. Solid Surface Based Products:		
a. Tensile Strength	6000 psi min	ASTM D638
b. Tensile Modulus	1.5 x 10^6 psi min	ASTM D638
c. Tensile Elongation	0.4% min.	ASTM D638
d. Flexural Strength	10000 psi min	ASTM D790
e. Flexural Modulus	1.2 x 10^6 psi min	ASTM D790

f.	Hardness	>85-Rockwell "M" scale min.		ASTM D785
g.	Thermal Expansion	2.2 x 10^{-5} in./in./°F		ASTM E228
h.	Fungi and Bacteria	Does not support microbial growth		ASTM G21 & G22
i.	Microbial Resistance	Highly resistant to mold growth		UL 2824
j.	Ball Impact	No fracture - 1/2 lb. Ball: 6 mm slab - 36" drop 12 mm slab - 144" drop		NEMA LD 3, Method 3.8
k.	Weatherability	ΔE*94<5 in 1,000 hrs		ASTM G155
l.	Flammability			ASTM E84, NFPA 255 & UL 723
		All Colors		
		6 mm	**12 mm**	
m.	Flame Spread	<25	<25	
n.	Smoke Developed	<25	<25	
o.	Class	A	A	NFPA 101, Life Safety Code

C. Solid Surface Material:

D. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:

E. Flammability: Class 1 and A when tested to UL 723.

F. Adhesive for Bonding to Other Products: One component silicone to ASTM C920.

G. Sealant: A standard mildew-resistant, FDA/UL recognized silicone color matched sealant or clear silicone sealants.

H. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

I. Heat Reflecting Tape: Manufacturer’s standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

J. Insulating Nomex® Fabric: Manufacturer’s standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.3 COMPONENTS

A. Window Sills: 1/2" thick solid surfacing material, adhesively joined with inconspicuous seams, edge details as indicated on Drawings. Color selected later by Architect from manufacturer’s full color range.

B. Counter Perimeter Frame: Ensure 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only

C. Lavatory Tops: 3/4" thick countertop of [solid polymer] [100% acrylic] [polyester-acrylic blend] solid surfacing material, cast to desired profiles and sizes having edge details as indicated on Drawings conforming to CSA B45.5/IAPMO Z124. Provide countertops complete with backsplashes of size shown on Drawings. Ensure countertop

and backsplash is color; single color [non-coved] [coved] as selected by Architect. Ensure [5] bowls are [ ] model.

D. Fabrication:

1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.

2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.

3. Ensure no blistering, whitening and cracking of components during forming.

4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes for most colors may be fabricated by traditional means discussed in K-25294 *Backsplashe*s. Colors with metallic/mica particle or veined colors creating directional aesthetics (K-26833 *Directional Aesthetics*) may require the techniques in Technical Bulletin K-28235 *Thermoformed Backsplash*.

5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.

6. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.

7. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.

8. Finish: Ensure surfaces have uniform finish:

   a. Matte, with a 60° gloss rating of 5 - 20.

   b. Semi-gloss, with a 60° gloss rating of 25 - 50.

   c. Polished, with a 60° gloss rating of 55 - 80.

9. Fabrication Tolerances:

   a. Variation in Component Size: +/-1/8".

   b. Location of Openings: +/-1/8" from indicated location.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Verify actual site dimensions and location of adjacent materials prior to commencing work.

3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".

4. Notify Architect in writing of any conditions which would be detrimental to installation.

B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 INSTALLATION

A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer’s written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.

E. Adhere topmount sinks/bowls to countertops using manufacturer recommended adhesives and white silicone sealant.

F. Seal between wall and components with joint sealant as specified herein and in Section 07 92 00, as applicable.

G. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer’s standard color-coordinated joint adhesive.

H. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

I. Coordinate connections of plumbing fixtures with [Division 22] [Mechanical]. Make plumbing connections to sinks in accordance with [Division 22] [Mechanical].

3.3 REPAIR

A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.4 SITE QUALITY CONTROL

A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.5 CLEANING

A. Remove excess adhesive and sealant from visible surfaces.

B. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

3.6 PROTECTION

A. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

B. Protect surfaces from damage until date of Substantial Completion of the Work.

END OF SECTION 066116

SECTION 071113

BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the bituminous dampproofing as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Dampproofing applied to exterior side of foundation walls.

2. Protection board.

1.3 RELATED SECTIONS

A. Concrete work - Section 033000.

B. Earthwork - Section 312000.

1.4 SUBMITTALS

A. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

B. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site, ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name, and manufacturer's name. Delivered materials shall be identical to approved samples.

B. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.

1.6 JOB CONDITIONS

A. Environmental Requirements: Dampproofing materials shall not be installed on wet surfaces, or when the temperature is 32 deg. F. and falling.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide trowel grade mastic manufactured from a blend of selected asphalts, stabilizers, fibers and solvents in compliance with ASTM D 4586, Type 1, (non-asbestos) equal to Karnak 86 AF manufactured by the Karnak Corp. or equal made by Sonneborn, Anti-Hydro or approved equal.

B. Priming Material: Applied to the concrete surfaces prior to the installation of the dampproofing, as required and/or recommended by the manufacturer.

C. Protection Boards: For the protection of the dampproofing after installation and before backfilling: provide 1/8" thick, multi-ply, semi-rigid board, consisting of a mineral stabilized asphalt core sandwiched between layers of asphalt saturated felt, and faced on one side with polyethylene film.

1. W.R. Meadows Inc.

2. Sonneborn.

D. Glass Fabric: Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type I.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where bituminous dampproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Surfaces to Receive Dampproofing: Clean, dry, smooth and free from surface treatments which may inhibit the bond of the dampproofing. Treat imperfections in these surfaces such as large cracks, honeycombs and holes prior to the dampproofing application, by repair work consisting of filling with cement, or as directed.

B. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

C. The start of the dampproofing installation shall imply acceptance of those surfaces, and conditions encountered in the field, to install the work, as recommended and as specified.

3.3 INSTALLATION

A. Perform the work using skilled workmen in accordance with the acceptable manufacturer's instructions and directions.

B. Prime surfaces to receive dampproofing using Karnak No. 108 primer, as recommended by the manufacturer, carefully following label instructions as to rate of coverage.

C. Apply two (2) coats of dampproofing continuously, at a rate of 6 gallon/100 sq. ft. per coat.

D. At changes in plane or where otherwise shown as "reinforced", install lapped course of glass fabric in first coat of dampproofing compound before it thickens.

E. Install 2" x 2" cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.

F. Apply vertical dampproofing down walls from finished grade line to top of footing, extend over top of footing, and down a minimum of 6" over outside face of footing. Extend 12" onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

G. Protect the installed dampproofing by embedding the protection boards into the dampproofing when the dampproofing becomes tacky, or as recommended by the manufacturer.

3.4 PROTECTION

A. Protect surfaces adjacent to the dampproofing operations against staining or other damage during the work of this Section.

B. Staining or soiling which does occur to the adjacent materials shall be removed as the work progresses, including smear, spills or displaced materials. Leave installed work in a neat condition upon completion.

C. Backfilling against completed dampproofing shall not occur for at least 72 hours.

END OF SECTION 071113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 071326

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet membrane waterproofing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Sheet membrane waterproofing for foundation wall surfaces.

2. Sheet membrane waterproofing for under-slab conditions.

3. Sheet membrane waterproofing for blindside of foundation wall surfaces.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 033000.

B. Earthwork - Section 312000.

1.4 QUALITY ASSURANCE

A. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; Construction Manager; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing waterproofing.

B. Qualifications of Subcontractors

1. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.

2. Qualifications of Subcontractors: Subcontractors shall submit evidence of being bona fide waterproofing subcontractors, for a period of not less than five (5) years, and that they are approved by the manufacturer of the waterproofing material for the installation of the manufacturer’s material in accordance with the requirements of this Section.

a. Subcontractor shall submit a letter from manufacturer of waterproofing material stating that subcontractor is approved by the manufacturer for the application of the waterproofing systems specified and accepted for use on the Project.
b. Letter shall certify that the subcontractor has previously and satisfactorily applied the waterproofing systems specified herein on jobs of similar size and scope, under manufacturer's supervision.
c. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company, not by a local sales representative.

C. Manufacturer's Representative/Contractor's Certification

1. Representative of the waterproofing material manufacturer shall be required to provide field instructions and supervision for the installation of the waterproofing systems at the start of the work of this Section.

2. The manufacturer's representative shall be required to make sure that the workmen for waterproofing systems on the site of the Project are fully instructed and trained in the handling and application of all the materials and shall see that all the materials are correctly installed.

3. Upon completion of the Installation, submit to the Architect written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials were correctly installed.

1.5 SUBMITTALS

A. Shop Drawings: Typical installation details, showing details at flashings, at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in membrane system.

B. Samples - Submit

1. Membrane, 6" x 6" samples of each membrane.

2. 6" x 6" sample of flashing.

3. 6" x 6" sample of drainage board.

C. Manufacturer's Literature: Submit manufacturer's technical, safety data sheets, and installation literature for all materials of this Section. Submit Independent Test data indicating that membrane meets properties specified herein.

D. General Contractor's Certification: Submit per Article 1.4.

1.6 STORAGE OF MATERIALS

A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material with expiration date where appropriate.

B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.

C. Material shall be stored out of the weather in a clean, dry area.

D. Liquid materials, such as adhesives, thinners, and primers, shall be stored in areas away from sparks, open flames, and excessive heat.

1.7 JOB CONDITIONS

A. No application of waterproofing shall commence or proceed during inclement weather, or the threat of imminent precipitation.

B. All surfaces to receive the system shall be thoroughly dry and free of dew or frost.

C. Materials shall be stored until time of mixing at temperatures above 60 deg. F. to maintain a consistency suitable for mixing. Do no work below 40 deg. F.

D. Prior to and during application, all dirt and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.

E. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.

1.8 PROTECTION

A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

B. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during the installation, and after the installation until membrane systems are covered with protective boards or with the specified finishing materials.

C. Against Damage: Protect vertically installed work of this section from damage by reinforcing and placement.

1. Take and maintain necessary preventive measures to protect work of this Section from damage until Project is accepted.

2. Rejection of Damaged Work

a. Damaged materials or work will be rejected.
b. Rejected materials or work must be immediately removed and replaced with new materials.

1.9 FIELD QUALITY CONTROL

A. Construction Traffic:

1. Limit construction traffic over completed membrane.

2. General Contractor shall provide 1/2 in. plywood protection layer, where construction traffic is unavoidable.

B. Inform Architect in writing on a daily basis of any of the following events. State specific location of each occurrence.

1. Buckling to the Waterproofing and other deformations as a result of ground water events.

2. Leakage through the finished waterproofing installation.

3. Damage by other trades.

C. Provide Manufacturer's Representative's report (prior to backfill) stating that the waterproofing has been inspected and is acceptable and eligible for manufacturer's warranty.

1.10 WARRANTY

A. The manufacturer of the waterproofing system executed under this Section warrants the waterproofing system to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract, and that he, agrees to promptly make repairs or replace defective waterproofing materials during the warranty period.

B. Contractor's Two-Year Workmanship Warranty: Provide a written guarantee for all work of this Section, stating that if, within two years after the Date of Substantial Completion of the Work, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. The guarantee shall state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney's fees, to enforce compliance with the obligations of this Guarantee, and will replace any material or system that requires repeated maintenance or repair to function effectively. The obligation of this Guarantee shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract and shall not be limited by Conditions other than this Contract.

PART 2 PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Trade names used herein for membrane waterproofing are those of GCP Applied Technologies. Other acceptable manufacturers will be Carlisle Coatings and Waterproofing (CCW), Henry Company or approved equal.

B. For foundation walls, provide "Bituthene 4000" sheet waterproofing membrane, 60 mils thick and "Liquid Membrane," 60 mils thick, for flashing, as manufactured by GCP Applied Technologies or approved equal.

C. At under-slab conditions, provide adhesive coated HDPE Composite Sheet "Preprufe 300R Plus" system by GCP Applied Technologies or approved equal.

1. HDPE membrane or reinforced TPO membrane shall have a protective layer to protect the membrane from the weather and U.V. for up to 56 days before casting concrete against it.

D. At vertical blind side waterproof conditions, provide adhesive-coated HDPE composite sheet "Preprufe 160R Plus" system by GCP Applied Technologies, or approved equal.

E. Primer/Conditioner: "Bituthene 4000" latex/water-based primer specifically formulated to provide adhesion of Bituthene Waterproofing Membranes.

1. If water-based primer does not provide sufficient adhesion to substrate, substitute Bituthane Primer B-2 solvent-based primer.

F. Bituthene Elastomeric Mastic: Rubberized asphalt base mastic.

G. Tape: Double sided synthetic adhesive tape equal to "Preprufe LT" and "HC."

H. Protection Board: 1/4" thick semi-rigid protection board, "Bituthene Asphaltic Hardboard."

I. Bituthene Liquid Membrane: Two-component 100% solids trowel grade asphalt modified urethane.

J. Drainage Board/Composite: Prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side.

1. Vertical Applications

a. "Hydroduct 220" by GCP Applied Technologies.
b. Or approved equal.

2. Horizontal Applications

a. "Hydroduct 660" by GCP Applied Technologies.
b. Or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where membrane waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work implies acceptance of substrate.

3.2 PREPARATION OF SURFACES TO RECEIVE WATERPROOFING

A. Conform to the requirements of specified manufacturer.

B. Earth or crushed stone substrates shall be compacted to produce an even, sound substrate. Loose aggregate, sharp protrusions and standing water shall be removed.

3.3 INSTALLATION OF FOUNDATION WALL WATERPROOFING

A. General: Conform to recommendations and published specifications of the manufacturer' including environmental requirements and preparation requirements to receive waterproofing.

B. Foundation Walls

1. General: The membrane, when in place must withstand a minimum static ground water pressure of 150 feet.

2. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller or brush at a rate of 250 - 350 sq. ft. per gallon. Roller shall be natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the day surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes.

   a. Bituthene 4000 Surface Conditioner should not be applied below 25 deg. F. on vertical surfaces. Allow primer to dry 30 minutes. Conditioner is considered dry when the substrate returns to its original color.
   b. Re-prime areas that become dusty or dirty prior to membrane installation.

3. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8' in length or less. On higher walls apply two or more sections with the upper overlapping the lower by a least 2-1/2". Press all membrane in place with heavy hand pressure or rollers during application.

4. Sealing Edges: Bituthene Waterproofing Membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are terminated on the vertical surface, a reglet or counter flashing may be used or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of Bituthene Mastic to all vertical and horizontal terminations. Bituthene Liquid Membrane can be used as an alternative method at the General Contractor's option.

5. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of Bituthene and press or roll in place. The edges of the patch shall be sealed with a troweling of mastic. Laps within 12" of all corners shall be sealed with a troweling of mastic.

6. Corner Forming: Outside corners must be free of sharp edges. Inside corners shall receive a fillet formed with Liquid Membrane, latex modified cement mortar equal to Daraweld C made by Grace mixed with cement mortar or epoxy mortar. Do not

use fiber or wood cants. One of two methods may be used for treating corners at the General Contractor's option:

a. Apply Bituthene Liquid Membrane 6" in each direction from the corner and form a fillet with a minimum 3/4" face.
b. Install an 11" minimum strip of Bituthene Membrane centered on the corner. Install Bituthene Membrane over the treated inside and outside corners.

7. Over waterproofing, apply drainage composite board by adhering board to cured membrane using tape or adhesive per manufacturer’s recommendations; lap all edges 4” and conform to the following:

a. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.
b. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut "lock strips" consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of the joint. Snap dimples of lock strip to dimples of each panel and reattach fabric over the panel joint.
c. Cut the core of the drainage panels around penetrations and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.
d. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

3.4 INSTALLATION OF BELOW-GRADE, UNDERSLAB WATERPROOFING

A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.

B. Preparation

1. Surfaces to receive blind side membranes must be smooth and sound, with no gaps or voids in excess of 1/2 in. Earth and stone substrates must be compacted to produce an even, solid substrate. If required by membrane manufacturer, provide an additional layer of underlayment protection board over sharp or angular stone substrates. Surfaces to receive waterproofing shall be thoroughly dry and free of moisture.

2. General: Comply with manufacturer's instructions for preparing surface including joint or crack treatment.

3. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Reprime areas not covered by waterproofing membrane within 24 hrs.

C. Underslab Applications

1. Apply Hydroduct 660 drainage composite board as recommended by manufacturer over the compacted sub-grade.

2. Apply the membrane over the drainage composite board with the HDPE side facing the drainage composite board and the treated white coating surface facing the concrete to be poured. The membrane may be installed at any convenient length. Apply succeeding sheets by overlapping previous sheets 3" along the self-adhesive edge of the membrane. Remove the silicone coated release liner covering the membrane and roll the side lap to assure a tight seal.

3.5 INSTALLATION OF VERTICAL BLIND-SIDE WATERPROOFING

A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.

1. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.

2. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut “lock strips” consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of the joint. Snap dimples of “lock strip” to dimples of each panel and reattach fabric over the panel joint.

3. Cut the core of the drainage panels around penetrations and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.

4. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

B. Preparation

1. Surfaces to receive blind side membranes must be smooth and sound, with no gaps or voids in excess of 1/2". Earth and stone substrates must be compacted to produce an even, solid substrate. If required by membrane manufacturer, provide an additional layer of underlayment protection board over sharp or angular stone substrates. Surfaces to receive waterproofing shall be thoroughly dry and free of moisture.

2. General: Comply with manufacturer's instructions for preparing surface including joint or crack treatment.

3. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Reprime areas not covered by waterproofing membrane within 24 hours.

C. Wall Applications: Refer to manufacturer’s literature for complete installation instructions but not limited to the following:

1. Apply Hydroduct 220 Drainage Composite to a point 6" below grade line. Fasten Hydroduct 220 to the adjacent buildings foundation wall or soil retention system.

2. Peel back bottom flap of filter fabric and place core behind discharge pipe. Wrap loose filter fabric over and around discharge pipe. Tuck excess filter fabric behind pipe. Fold excess filter fabric at top termination down between drainage composite and membrane.

3. Apply membrane with the HDPE film facing the soil retention system or adjacent foundation. Remove the release liner and fasten membrane to Hydroduct drainage composite with large head nails or staples. All nail heads or staples must be covered with overlapping sheets of membrane.

4. Apply succeeding sheets by overlapping the previous sheet 3 inches along the uncoated edge of the membrane.

5. Overlap the ends of the membrane 3 inches. Apply Preprufe Tape centered over the end lap and roll firmly. Remove release liner.

6. Seal all transition, penetrations, tie down bracing and other conditions with initial membrane layer plus manufacturer’s recommended accessory materials, prior to application of the full membrane.

7. Concrete must be poured within 30 days of membrane application. Protect membrane until concrete pour.

8. If membrane ties into a vertical membrane, leave an additional 12" flap of Preprufe membrane to tie into Bituthene membrane.

3.6 SEAM REINFORCEMENT FOR HDPE COMPOSITE SHEETS ONLY

A. Provide a 6 in. strip of modified bituminous sheet membrane (Bituthene 4000) centered behind all laps.

B. At locations where a salvage edge is not present and at end laps, lap sheets 6 in., apply a 1/8 in. thick by 6 in. wide application of liquid membrane between sheets, to provide a 6 in. wide seal.

C. Integration of old onto new pre-applied sheet membrane.

1. Integration of Sheet Membrane onto Sheet Membrane that has been installed in excess of 30 days prior

a. Lap sheets 12 in., apply a 1/8 in. thick by 12 in. wide application of fluid membrane between sheets, to provide a 12 in. wide seal at this location.
b. Install Waterproofing Tape centered at edge of lap and roll firmly into place with an approved roller.
c. Install additional Waterproofing Tape to cover white film that has been installed over 30 days prior.

2. Repair of pre-applied sheet membrane

   a. Scratch on white coating exposing underlying black surface of Sheet Membrane. Install Waterproofing Tape at areas where the white coating of the membrane is damaged, including boot scuff marks and abrasions by rebar.
   b. Damage or Puncture of Sheet Membrane: Install Patch of short Membrane set in Liquid Membrane. Patch must extend 3 in. in every direction around extent of damaged area. Install Waterproofing Tape centered over the edge of the patch. If the damaged area does not have 5 in. of sound material around it, inject Liquid Membrane into puncture until Liquid Membrane backs out, and proceed with patch as space allows.

3.7 CLEAN-UP

A. Upon completion of the waterproofing system, the General Contractor shall remove all equipment, material and debris from the work and storage area, and leave those areas in an undamaged and acceptable condition.

END OF SECTION 071326

SECTION 07 14 00

FLUID-APPLIED WATAERPROOFING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Provide fluid-applied waterproofing system, including necessary accessories and auxiliary materials, for roof of entrance canopy as indicated on Drawings and as specified herein, including, but not limited to, the following:

1. Reinforced fluid-applied roofing membrane
2. Protection Sheet
3. Flexible uncured neoprene flashing
4. Drainage panels
5. Rigid Insulation
6. Filter fabric
7. All required primers and accessories
8. Testing of membrane integrity by Low-Voltage Electric Integrity Testing (LVEIT) methodology, such as EFVM by International Leak Detection

1.2 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. ASTM International (ASTM).

C. Underwriters Laboratories, Inc. (UL).

D. National Roofing Contractors Association (NRCA).

E. Thermal Insulation Manufacturers Association (TIMA).

F. Factory Mutual Global (FM)

G. United States Environmental Protection Agency (EPA)

1.3 SUBMITTALS

A. Miscellaneous Submittals and Product Data

1. Submit manufacturer's complete technical and installation literature for all materials of this Section.

2. When the roofing and flashing system of a proposed manufacturer incorporates materials, details, or installation methods that differ from those indicated in the Specifications or Drawings, submit complete product information for consideration by the Architect, as required by Specifications Division 1, and the General Conditions. Submit information prior to start of any Work that would be affected by the proposed substitutions.

3. Submit membrane manufacturer's requirements for characteristics of concrete substrate, prior to start of Cast-in-Place Concrete work.

4. Submit written approval from membrane manufacturer confirming compatibility of the roofing system with the specified concrete roof deck and fill materials, prior to start of Cast-in-Place Concrete work.

5. Manufacturer's Warranty: Sample copy of the membrane manufacturer's 20-year warranty covering workmanship and materials, conforming to requirements of this Section. Warranty is to specifically indicate removal and replacement of overburden.

B. Shop Drawings

1. Submit installation details for roofing systems to show, at a minimum, details at drains, at reinforcing, at flashing, at terminations, at joints in structure below, at intersection of horizontal and vertical surfaces, at penetrations, and at roof parapets.

a. Submit for typical and non-typical conditions of Project. Manufacturer's standard data sheets are not acceptable for shop drawings.

b. Indicate and identify materials to be incorporated in the work, dimensions, thickness of each materials and system, and relationships to adjacent construction.

c. When there is a proposed deviation from the Contract Documents, submit the revised detail labeled as such for approval.

2. Roof membrane manufacturer shall review and approve roof detail shop drawings submitted for Work of Section 07600, Flashing and Sheet Metal, prior to review by the Architect.

C. Samples: Submit the following, with manufacturer's printed product identification on each item:

1. Insulation Material: 12" x 18".

2. Drainage panel: 12” x 12”.

3. Flashing and Reinforcing Materials: Each type and thickness required for project, minimum 12" long.
4. Fabric Sheets: Each type required for project, 12" x 12".
5. Roofing membrane materials: each type required for the project.
6. Protection sheet: 12” x 12”.

D. Quality Control Submittals

1. Fire Hazard Certification:
   a. Written certification that the roof system, including the specific insulation, has been tested in conjunction with the type of structural roof deck and roof slope applicable to the project and has achieved an Underwriters Laboratories Class A external fire resistance rating.
   b. Certification: Letter from Underwriters Laboratories, or a copy of the Underwriters Laboratories classification listing for the roofing system.
2. Material Certifications:
   a. Letter from the roofing membrane manufacturer certifying that the insulation is approved for use with the roofing system.
   b. Certification of an approved independent testing laboratory certifying that the membrane material meets the specified ASTM and CGSB standards.
   c. Letter from the roofing membrane manufacturer certifying that the submitted materials and installation instructions are in conformance with the latest roofing system specifications of the manufacturer.
   d. Certification by an approved independent testing laboratory certifying that the precast concrete pavers proposed for the project conform to specified requirements for solar reflectance.
3. Membrane Manufacturers Certifications:
   a. Submit a letter certifying that the manufacturer has been actively marketing the submitted system for a minimum of ten years.
   b. Submit the names and addresses of five roofing projects of same size and scope as this project, using this system, that have been in service for at least 10 years.
4. Applicator's Certification:
   a. Letter from the membrane manufacturer certifying that the applicator is licensed or approved to install the specified roof system, and has been in operation applying the system for 5 years or more.
   b. Names, address, and telephone numbers of five buildings where the applicator has installed the same type of fluid-applied hot rubberized asphalt roofing systems, which have the manufacturer's warranty issued. Include the types of roofing systems installed, the manufacturer's name, and the warranty numbers.

c. Letter certifying that the job foreman or crew chief and at least one other member of the roofing crew have installed at least five fluid-applied hot rubberized asphalt roofing systems and are thoroughly familiar with all aspects of the installation.

d. Evidence of job foreman training as specified under Article titled Quality Assurance.

e. Letter from manufacturer stating that the project is registered with the manufacturer. The Contractor is to bring this to the Pre-installation conference.

5. LVEIT testing firm qualifications including acceptance by membrane manufacturer

6. Required Roofing System Rating: Class A.

E. LVEIT test reports

Test reports for each roof showing initial testing results and final testing results with statement that the roof test indicates no breeches.

F. Contract Closeout Submittals:

1. Membrane manufacturer representative’s certification of completed roof system: As specified.

2. Guaranty and Warranty: As specified.

1.4 QUALITY ASSURANCE

A. Membrane Manufacturer's Qualifications

1. The manufacturer shall have the technical expertise and qualified technical representatives to promptly resolve questions or problems that may arise both during and after the Work is completed.

2. The manufacturer shall have been actively marketing a fluid-applied rubberized asphalt roof system for a minimum of five years.

3. The manufacturer shall provide the names of at least five previous projects of comparable size, scope, and complexity as the Work of this Section.

4. The manufacturer must require that the roof system be installed by a licensed or approved applicator.

B. Waterproofing Installation Qualifications

1. Waterproofing Firm Qualifications

a. Installation of a minimum of 10 waterproofing systems of type specified herein.

b. (List last 5 such jobs, including address, type of system, square footage, date installed and owner/agent with whom contracted).

c. In continuous operation of installing such waterproofing systems for 5 years or more.

d. Manufacturer’s certified installer for the waterproofing materials to be installed.

C. Low-Voltage Electric Integrity Testing (LVEIT) Firm Qualifications. Engage the services of an LVEIT Consulting firm to perform testing of all membranes. Obtain from the membrane manufacturer the name of an LVEIT firm(s) they will accept to provide the report that will used as part of the basis for the membrane manufacturer issuing the warranty. The firm shall have no less than a 5-year track record in the use of LVEIT technology.

D. Fire Hazard Classification

1. The roof system shall have an Underwriters Laboratories Class A External Fire Resistance rating.

2. The roof system, which includes a specific generic type of insulation and in some instances a specific name brand insulation, shall have been tested in conjunction with the type of structural roof deck and roof slope applicable to the project.

E. Company Field Advisor

Secure the services of a Company Field Advisor of the membrane manufacturer for a minimum of 30 working hours. The Field Advisor shall be certified in writing by the manufacturer to be technically qualified in design, installation, and servicing of the required products. Personnel involved solely in sales do not qualify. The Field Advisor shall be present at the Pre-Installation Conference and at the beginning of the actual membrane installation for the purpose of:

1. Verifying that conditions are satisfactory for installation of the membrane.

2. Rendering technical assistance to the Contractor regarding installation procedures of the system.

3. Answering all questions that might arise.

The Field Advisor shall also make, at a minimum, weekly visits during the active installation of the Work, and shall certify roof upon completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Materials shall be delivered to the project site in manufacturer's unopened containers with manufacturer's brand name, instructions for use, all identifying numbers, and UL labels clearly marked thereon.

B. Storage

1. Store containers of materials on end, on wood or other clean rigid pad, a minimum of 6" off the ground, to prevent adherence of foreign material. Roll goods shall be stored on end in unopened packages.
2. Store in a neat, safe manner, clean and dry, protected from water, sunlight, excessive heat and humidity and open flame.
3. Temperature of storage area for adhesives shall be between 60oF and 80oF, or as otherwise recommended by the manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental

1. Weather: Roofing systems shall not be applied in wet weather nor when frost or ice is on surfaces to receive work of this Section.
2. Temperature: Surface and air temperature shall be as recommended in writing by manufacturer of the materials being installed.

B. All surfaces to receive the membrane shall be free of water, dew, frost, snow, ice, or moisture of any kind, debris, and dust.

C. Preparation and application of membrane must be conducted in well ventilated areas.

D. After installation do not expose membrane to temperatures in excess of 180□F.

E. Do not use adhesives near an open fire. Do not use in confined areas without adequate ventilation. Consult container or packaging labels and Safety Data Sheets (SDS) for specific safety information.

F. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.), or foreign chemicals or materials, to come in contact with the roof membrane.

1.7 CONTRACTOR'S GUARANTEE

A. The Contractor agrees as part of this Contract that all Roofing, Flashing, Sheet Metal Work, Parapet, Coping, and the entire envelope of the roofing system of this contract will be watertight and free from defects due to workmanship and material for a period of two years. Time of guarantee shall commence with approval of the substantial completion payment for the Work, or the final payment for the work if no substantial completion payment is made.

B. Should any defects develop or any leaks occur during the period of guarantee, such defects or leaks shall at once be remedied and all damage caused by such defects or leaks shall be repaired and corrected without cost or expense to the Owner, which is thus inclusive of overburden removal and replacement.

C. In the event of failure on the part of the Contractor to commence within three (3) days after the notification by the Owner or the Construction Manager, any Work required to be performed under the terms of the this guarantee, and to complete the same within a reasonable time thereafter, the Owner may have such work done by other parties and charge the cost thereof to the Contractor and the Surety herein.

D. The Performance Bonding Company's guarantee shall be for the entire two-year guarantee period.

1.8 ROOFING SYSTEM GUARANTEE/WARRANTY (ROOFING MANUFACTURER)

A. Furnish the roofing system manufacturer's twenty (20) year single-source warranty for the Work of this Section. The warranty shall include, but not be limited to, repair of leakage caused by defects in materials and workmanship. The monetary value of the warranty shall be at least equal to the original cost of the installation; including labor, materials and equipment.

B. The roof system shall be warranted to remain watertight for twenty years.

C. All components of the roof system, including but not limited to membrane, flashing, parapet waterproofing, protection course, reinforcement, drainage panels, insulation, filter fabric, and pavers shall be covered under the warranty. Pavers shall be covered for 10 years; all other components shall be covered for 20 years. In the event that defects or leaks occur the manufacturer will make repairs to correct them, which thus includes all overburden removal and replacement/reinstallation.

D. This warranty is in addition to the Contractor's guarantee described in this Section.

1.9 PROTECTION

A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work. Use insulation and 3/4" thick minimum plywood or other approved means to safely distribute the loads.

B. Against Traffic: Do not permit traffic on work of this Section, except for workmen doing the work, during the installation and after the installation until membrane systems are protected. Use 3/4” thick minimum plywood and insulation for temporary pathways if required.

C. Rejection of Damaged Work

1. Materials or installed work damaged during project construction activities will be subject to rejection.

2. Rejected materials or work must be immediately removed and replaced with new materials, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturer and product systems shall be construed to mean the establishing of a minimum quality and performance standards for the specified item. Minimum thicknesses are indicated but each manufacturer will have a specific minimum thickness that may be greater than that provided to meet the performance requirements and warranty provisions and must be provided if a thicker membrane is required.

1. American Hydrotech, Chicago, IL
2. Henry Company, El Segundo, CA
3. Barret Company (Keene Family of Companies), Cleveland, OH
4. Tremco Inc., Beachwood OH
5. Carlisle Coatings & Waterproofing, Wylie, TX

2.2 MATERIALS

A. Provide fluid-applied, rubberized asphalt, fabric reinforced roofing system as indicated in the Drawings and Specifications.

B. Hot-Rubberized Asphalt System

1. Roof system shall meet or exceed such wind performance criteria as would be required to achieve the equivalent of a FM 1-90 classification.
2. Membrane: A hot applied, rubberized asphalt membrane meeting the following physical properties:

Properties	Test Method	Typical Value
Flash point	ASTM D92	475°F*
Low temperature crack bridging capability	CGSB-37.50-M89**	No cracking, adhesion loss, or splitting
Water vapor permeability	ASTM E96, Procedure E CGSB-37.50-M89	0.027 perm.
Water resistance 5 days/50°C	CGSB-37.50 -M89	No delamination, blistering, emulsification, or deterioration.
Water absorption	CGSB-37.50-M89	Gain in weight: 0.22g max. Loss in wt.: 0.18g max

Heat stability	CGSB-37.50-M89	No change in viscosity, penetration, flow or low temperature.
Low temperature Flexibility (-25°C)	CGSB-37.50-M89	No delamination, adhesion loss or cracking.
Penetration	ASTM D5329	@ 77°F., max. 100. @ 122°F.,max. 200.
Flow	ASTM D5329 CGSB-37.50-M89	@ 140°F., 3.0mm max.
Softening point	ASTM D36	180°F.
Elongation	ASTM D5329	1000% min.
Resiliency	ASTM D3407	40% min.
Bond to concrete	ASTM D3407	Pass 0°F
Solids content		100% - no solvents.
Shelf life		10 years (sealed containers)
Acid resistance	ASTM D896 Proc. 7.1 Note 8	Pass Nitric 50% Pass Sulfuric 50%
Toughness	CGSB-37.50-M89	16.0 Joules
Ratio of toughness to peak load	CGSB-37.50-M89	0.069
Viscosity	CGSB-37.50-M89	11.0 seconds
Specific gravity		1.23

* not less than 77°F (25°C) above the manufacturer's maximum recommended application temperature.

** Canadian General Standards Board (CGSB)

3. Roofing membrane shall be manufactured with a minimum of 7% of post-consumer content materials.

4. Primer: An asphalt based primer for concrete surfaces meeting ASTM D41-85 and/or CGSB-9M; as recommended by the manufacturer of the membrane.

5. Flashing/Reinforcing

   a. Manufacturer's PMMA, PUMA or urethane fleece reinforced flashing system for use at penetrations and flashings to a minimum 8" above finished roof surface levels.

   b. Modified bitumen SBS cap sheet, as used for full height flashing (above 8" above roof level)/waterproofing of parapets: 140 mils thick minimum, white granular surface. ASTM D6164 Type 1 Grade G. UL Classified.

   c. Flexible Flashing/Reinforcing: 60-mil thick uncured neoprene flashing/reinforcing sheet for full height flashing(above 8" above roof level)/waterproofing of parapets meeting the following physical properties; as recommended by the manufacturer of the membrane.

Property	Test Method	Requirement/Result
Thickness		60 mil
Tensile Strength	ASTM D412	DIE C 1400 psi
Elongation	ASTM D412	DIE C 300% min.
Tear Resistance	ASTM D624	DIE C 125 lb/in. min.
Brittleness Temp. (-30□F)	ASTM D2137	Does not break
Ozone Resistance	ASTM D1149	No Cracks

6. Fabric Reinforcing Sheet: polyester fabric. Meet the following physical properties, or as recommended by the manufacturer of the membrane.

Property	Test Method	Requirement/Result
Elongation	ASTM D5726	42% min.
Tear Strength	ASTM D5726	6 lb.
Breaking Strength	ASTM D5726	22 lb.
De Matia Flex Cycles	ASTM D813	100,000

7. Adhesives/Sealant

   a. Contact adhesive used to bond flashing together; as recommended by the manufacturer of the membrane.

   b. Contact adhesive used to bond flashing to an approved substrate; as recommended by the manufacturer of the membrane.

c. Sealant used to seal flashing seam edge; as recommended by the manufacturer of the membrane.

8. Protection sheet: A fiberglass reinforced, rubberized asphalt sheet, or other protection/separation course as recommended by the manufacturer of the roofing membrane. 70 to 90 mils thick, as recommended by the membrane manufacturer for the roofing system configuration.

9. Subject to compliance with the requirements, provide:

a. Monolithic Membrane 6125 FR EV, as manufactured and supplied by American Hydrotech, Inc., Chicago, IL.

b. Henry 790-11 EV reinforced membrane system, as manufactured and supplied by Henry Company, El Segundo, CA.

c. RamTough 250DM, as manufactured and supplied by Barrett Company, Cleveland, OH.

d. TREMproof 6100-25 fabric reinforced system, as manufactured and supplied by Tremco Inc., Beachwood, OH.

e. Carlisle 500R as manufactured and supplied by Carlisle Coatings & Waterproofing, Wylie, TX.

2.3 AUXILIARY MATERIALS

A. General: Provide related waterproofing materials as manufactured by or acceptable to the membrane manufacturer, including flashings, adhesives, sealants, reinforcing fabric, drainage panels, insulation, filter fabric, protection sheet, and pavers.

B. Wood Nailers/Blocking

Pressure treated meeting the AWPA U1-15 standard, Use Class UC3A, #2 or better lumber.

C. Miscellaneous Fasteners

Appropriate for purpose intended and approved by membrane system manufacturer; length required for thickness of material (with metal washers); as supplied by membrane manufacturer.

D. Drainage Panels: Geotextile-faced composite drainage panels of type recommended by the manufacturer of the roofing system. Facing laminated to both sides of a nonbiodegradable molded plastic sheet drainage core. Flow rate not less than 7 gpm/ft per ASTM D4716. Compressive strength 30,000 psf minimum. Thickness approximately 0.25” to 0.5”.

E. Insulation: Extruded polystyrene rigid board insulation such as Styrofoam brand roofing insulation by Dupont/Dow Chemical Co. or Foamular brand roofing insulation by Owens Corning as recommended by the manufacturer of the membrane and meeting the following physical properties:

1. Insulation shall meet ASTM C578, type VII.
2. Minimum compressive strength per ASTM D1621, 60 psi.
3. Maximum water absorption by volume per ASTM C272, 0.3%.
4. Water vapor permeance for 1" product per ASTM E96, 1.0 perm (max.)
5. Insulation shall have a minimum R-value of 40, 5.0□F•ft2•h/BTU (min.) per inch of thickness when tested at 75□F mean temperature in accordance with ASTM C518. Insulation manufacturer shall warrant product to retain at least 90% of original R-value for 15 years

F. Filter Fabric Sheet: Water permeable polymeric fabric, as recommended by the manufacturer of the membrane for filtering foreign materials and maintaining position of insulation boards.

G. Additional Materials: Provide cant strips, expansion joints, reglet bars, edge strips, accessories, tapes, primer, cements, and sealants as recommended by manufacturer of fluid-applied membrane.

2.4 PRE-INSTALLATION CONFERENCE

A. Before the roofing Work is scheduled to commence, a conference will be called by the Construction Manager at the site for the purpose of reviewing the Drawings and the Specifications and discussing requirements for the Work. The conference shall be attended by the Contractor, the authorized roofing applicator, the membrane manufacturer's Company Field Advisor, and the Architect.

B. Prior to the conference, the Contractor shall have registered the project with the membrane manufacturer and shall have submitted the membrane manufacturer's letter of intent to warranty the project. A copy of the letter is to be brought to the conference.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that Work of other trades that penetrates the roof deck or requires personnel and equipment to traverse the roof deck has been completed.

B. Examine surfaces for inadequate anchorage, foreign material, moisture, and unevenness that would prevent the execution, and quality of application, of the system as specified.

C. Do not proceed with application of system until defects are corrected.

3.2 PREPARATION

A. Condition of Surfaces: Surfaces to receive membrane shall be free of defects or conditions that will interfere with, or prevent, a satisfactory installation of waterproofing systems and shall comply with ASTM D5295.

1. Concrete surfaces shall be at least 28 days old and otherwise sufficiently cured to receive membrane.

2. Verify with membrane manufacturer and test field conditions for moisture content of concrete prior to membrane installation. Utilize procedure recommended by roofing manufacturer (e.g. ASTM D4263, NRCA deck dryness test, with heated waterproofing, etc.) Decks shall be thoroughly dried out and free of moisture. There shall be at least 2 test areas for every 2500 square feet of area to be waterproofed.

3. All surfaces shall be free of depressions, voids, protrusions, cracks, holes, unevenness and other unsatisfactory conditions of substrates. Concrete must be monolithic, without spalled areas, honeycombs and sharp protrusions. Patching of substrates is not permitted unless written permission is issued by the membrane manufacturer..

B. Contaminants

1. Surfaces shall be thoroughly cleaned and shall be free of water, dew, frost, dust, dirt oil, grease, concrete curing compounds, form release agents, laitance, and other foreign matter. Shotblast or sandblast if necessary to remove foreign materials, if so recommended by membrane manufacturer.

2. Dirt and dust shall be completely removed with an air compressor or industrial type vacuum cleaner or methods approved by membrane manufacturer so the surface shall pass a blue cloth test.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive membrane, including joints and cracks, drains, and penetrations, according to CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Membrane and Waterproof membrane," and membrane system manufacturer's written instructions.

1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D4258.

2. Moving Joints: Adhere strip of elastomeric flashing sheet to substrate in a layer of hot fluid-applied, rubberized asphalt. Extend flashing sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric flashing sheet.

3. Non-Moving Joints: Embed strip of reinforcing fabric into a layer of hot fluid-applied, rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond drains and penetrations.

   A. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

   B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric flashing sheet extended a minimum of 6 inches and 12 inches on each side of joints and adhere to substrates in layers of hot fluid-applied, rubberized asphalt. After installing foam expansion rod, apply second 12 inch sheet of elastomeric flashing over the foam rod and 6” sheet. Apply third layer of hot fluid-applied, rubberized asphalt over elastomeric reinforcing sheet.

3.4 INSTALLATION - PRIMER, REINFORCING, FLASHING, MEMBRANE, PROTECTION

A. Primer

1. Apply surface conditioner/primer to the concrete substrate evenly, at a rate recommended by the membrane manufacturer. Avoid excessive application. Ponding of the primer is not acceptable.

2. Allow sufficient time for the primer to thoroughly dry prior to the membrane application.

3. If primer is contaminated by dust, construction traffic or other sources, reprime as recommend by the manufacturer.

4. Prime and prepare parapet as recommended by the membrane manufacturer for application of full height flashing/waterproofing.

5. All metal flashing shall be bright metal clean, free of process oils and treated with conditioner/primer as recommended by the membrane manufacturer.

B. Reinforcing

1. Apply reinforcing to joints, cracks, changes in plane, and elsewhere as recommended by the membrane manufacturer.

C. Detailing/Flashing

1. All preparation of substrates and all detailing and flashings shall be done in accordance with the membrane manufacturer's printed instructions and as shown on the Drawings.

2. All detailing and flashing shall be completed before installing the membrane over the field of the substrate. Obtain prior written approval of the Project Architect or Engineer for conditions where the flashing assembly is properly installed in a different sequence.

3. Apply flashing at roof penetrations, vertical surfaces, drains, curbs, edges, and wherever required for a proper installation.

4. Where modified SBS or uncured neoprene base flashing terminates on a vertical wall surface, provide a continuous termination bar with mechanical fasteners spaced 12" o.c. maximum, and seal top edge. Install each and every night prior to leaving the job site to ensure rain does not get behind flashing. Conform to Drawing details and roofing manufacturers recommendations.

5. Provide flashing/waterproofing for the full height of parapets as indicated on the Drawings, and in accordance with the membrane manufacturer's written instructions. Materials and installation shall be as recommended by the membrane manufacturer as required for inclusion in the single source roof system warranty.

   Flashing/waterproofing assembly shall consist of one of the following, subparagraph a., b. or c. as recommended by the membrane manufacturer, and as indicated on approved Shop Drawings:

   a. Uncured neoprene flashing, 60 mils thick, adhered to back of parapet with membrane manufacturer's bonding adhesive or hot-rubberized asphalt; totally adhered without wrinkles. Provide termination bar and cap flashing as indicated on the Drawings. Where height of flashing on parapet exceeds 4'-0", or as recommended by the manufacturer, provide an intermediate termination bar at recommended height above concrete roof deck, and splice flashing as recommended by the manufacturer, with a six inch adhered lap covering the termination bar.

   b. Modified Bitumen SBS cap sheet, with white granular surface, adhered to back of parapet by embedding in 90 mils of hot rubberized asphalt or using torch; totally adhered without wrinkles. Provide uncured neoprene flashing reinforcing at roof/parapet transition and where recommended by the manufacturer. Reinforce rubberized asphalt with polyester felt if recommended by the manufacturer. Provide termination bar and cap flashing as indicated on the Drawings. Where recommended by the manufacturer because of the height of parapet provide an intermediate termination bar at recommended height above concrete roof deck, and splice the cap sheets as recommended by the manufacturer with a six inch adhered lap covering the termination bar. Coat white with acrylic elastomeric coating at any bleed-out of rubberized asphalt.

   c. PMMA and PUMA Flashing: Follow primary membrane manufacturer's installation recommendations.

D. Membrane

1. The membrane shall be heated in a double jacketed, oil bath melter, air jacketed melter, or other type of melter as approved by the Architect, with mechanical agitator and safety shutoff, specifically designed for the preparation of a rubberized asphalt membrane. Melter shall be equipped with thermometer and foreman shall record on a chart the temperatures to which materials have been heated; submit chart at end of each day to the Construction Manager. Only one fuel container

shall be on the roof at any one time, and it shall be removed at the end of the working day. Locate the container at least four feet away from the melter. Brace the container and shade it from the sun.

2. Provide fire extinguishers on the roof in the vicinity of the melters as required to ensure the safety of the roof.

3. Heat membrane until the material can be drawn, free flowing, at a temperature range stated in the membrane manufacturers written instructions. In no case shall material be heated above maximum temperature recommended by the manufacturer.

4. Apply the rubberized asphalt membrane at a rate to provide a continuous, monolithic coating of 90 mil minimum, into which fully embed a layer of the fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at minimum thickness of 125 mil. Total minimum thickness: 215 mils. Apply membrane smooth, free from air pockets, or wrinkles. Ensure full bond of membrane to substrate.

5. Overlap fabric reinforcing sheet at least 2", and in accordance with the membrane manufacturer's instructions.

E. Separation/Protection Layer

1. Embed protection sheet into the membrane while it is still warm if recommended by membrane manufacturer.

2. Overlap adjoining sheet edges to ensure complete coverage.

3. Cover sheet with drainage panels, insulation, filter fabric and ballast within time period recommended by membrane manufacturer, and not to exceed 30 days.

F. Perform LVEIT and flood testing as specified in Articles below prior to installation of insulation. If breaches or leaks are found, drain water completely, make all necessary repairs, and retest.

3.5 INSTALLATION – DRAINAGE PANELS, INSULATION, FILTER FABRIC

A. General: Examine the roof area to be covered with subsequent topping materials in order to ensure that all roof areas have received the membrane, the membrane is free of damage, it is properly protected, and all flashing has been properly installed, before placing the insulation. Installation of all components shall be in accordance with the written instructions of the membrane manufacturer. Do not begin installation until the LVEIT and flood testing has been completed and membrane accepted.

B. Drainage Panels

Place drainage panels over protection sheet according to manufacturer’s instructions and without penetrating the waterproofing membrane. Drain cores shall directly abut each other. Lap geotextile to maintain continuity.

C. Insulation

1. Loose lay in a staggered manner and tightly butt together all insulation boards. Occasional joint widths of up to 1/8" will be allowed. Insulation shall be installed within 3/4" of all projections, penetrations, and other discontinuities in the roofing system.

2. Install insulation to achieve the required R-value indicated in the Documents. Where total insulation thickness is more than 2”, install the required thickness in two or more layers with joints of each succeeding layer staggered over joints of previous layer a minimum of 6” in each direction. The bottom layer of insulation shall be the thickest layer and shall be at least 2” thick. Layers shall be installed unadhered to each other.

D. Filter Fabric: Install fabric over the insulation as described below. Include additional provisions as required to prevent insulation boards from shifting out of position if the roof is flooded:

1. Overlap all edges a minimum of 1'-0". Do not use lengths less than 6'-0".

2. Install fabric so that no joints will exist between the sheets parallel to and within 6 feet of the roof perimeter.

3. Extend fabric above the ballast at the perimeter and penetrations. The dimension of the extension above the ballast and the method of terminating and securing the fabric shall be as instructed by the membrane manufacturer.

4. Extend fabric to drain bases or bonnets, but do not cover drains or restrict water flow to the drains.

5. Install additional fabric around all penetrations in order to prevent foreign material entry into the space between the penetration and the insulation.

3.6 FIELD QUALITY CONTROL

A. Progress inspections of the roofing system installation by CID’s Inspector, including reviewing the temperature charts, will be done on regular visits. Roofing deficiencies are to be addressed for compliance verification prior to proceeding with the next phase of the system installation.

3.7 LVEIT PROCEDURE

A. After completion of the fluid-applied roofing membrane, but prior to flood testing and installation of insulation and other items, test watertightness of installation by performing an LVEIT. Survey shall conform to ASTM D7877.

B. Once membrane has met all previously required inspection and testing requirements, the Contractor’s LVEIT consultant shall install the conductor cable on the surface of the finished membrane and secure in a method as directed by the testing consultant. This cable is to be considered part of the Work of the project and shall remain in place at the

completion of the testing for future use by the Department of Education. The membrane shall then be wetted and field energized and the LVEIT consultant shall walk the roof areas while assessing the field for breaches and defects.

C. All breaches shall be marked on the membrane by the LVEIT consultant and repair shall be completed by the Contractor. The test shall be performed again to verify all breeches have been remedied. A formal report of all tests is to be submitted indicating all findings/areas of failure as well as photographic documentation and drawing of the test area.

D. Once tested and no failures noted, the membrane shall be protected and the flood test performed. Upon completion of entire roof system, the roof shall be retested using the same process as described above.

3.08 FLOOD TEST

A. After completion of the LVEIT but prior to installation of insulation and the remainder of the system, test the watertightness of installation by plugging drains and flooding with water to a minimum depth of 1″ above the high points for a period of 24 hours. For each flood test performed, the Contractor shall notify the Construction Manager when the minimum 1″ of water above high point has been reached to mark the start of test period for verification and notification to Architect to allow for inspection.

B. If there are steep areas of roofing or the water level will exceed 6” at any point, create dams to provide flood testing of the roof in sections.

C. If leaks occur, the water shall be drained completely; the membrane installation shall be repaired, and then re-tested. Continue repair and re-testing until installation is leak-free

3.8 MEMBRANE MANUFACTURER'S FINAL INSPECTION

A. After all of the fluid-applied membrane waterproofing work is completed, an inspection shall be made by the manufacturer's representative, who shall certify that the system has been installed according to the Specifications.

3.9 PROTECTION

A. Provide for protection of completed membrane during installation of other materials or processes over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane. Minimum protection: 3/4" thick exterior grade plywood.

B. Clean up all debris and equipment. Remove spatters and clean soiled surfaces. Check drains to ensure proper function.

END OF SECTION 071400

SECTION 07 18 00

TRAFFIC COATINGS

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 traffic coatings for the following applications:

1. Vehicular traffic.

2. Pavement markings.

B. Related Sections include the following:

1. Section 321216 "Asphalt Paving”

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Qualification Data: For Installer.

C. Material Certificates: For each traffic coating, signed by manufacturers.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of traffic coatings required for this Project.

B. Source Limitations:

1. Obtain traffic coatings from a single manufacturer.

2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer's brand name.

2. Type of material.

3. Directions for storage.

4. Date of manufacture and shelf life.

5. Lot or batch number.

6. Mixing and application instructions.

7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that will penetrate membrane have been installed.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period. Warranty does not include deterioration or failure of traffic coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or abuse by snowplow, maintenance equipment, and truck traffic.

1. Deterioration of traffic coatings includes the following:

a. Adhesive or cohesive failures.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.

1. Color: White or as indicated.

a. Use blue for spaces accessible to people with disabilities per requirements in the Americans with Disabilities Act.

2. Retroflective Glass Beads: clear, round glass beads. Beads shall be obtained from manufacturer compatible with paint product and application requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.

1. Verify compatibility with and suitability of substrates.

2. Verify that substrates are visibly dry and free of moisture.

3. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

3.3 PAVEMENT MARKINGS

A. Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil-minimum wet film thickness.

3.4 GLASS BEADS

A. Glass beads shall be installed per manufacturer’s recommendations.

3.5 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 072100

THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Insulation under slabs-on-grade.

2. Foundation wall insulation.

3. Batt insulation.

4. Spray-foam insulation at gaps around glazing frames, door frames, penetrations, and similar items in exterior wall assemblies for tie-in of air/vapor barrier to frames.

5. Attachment devices.

1.3 RELATED SECTIONS

A. Firestops and Smokeseals - Section 078413.

B. Curtain wall insulation - Section 084413.

C. Acoustical insulation - Section 092900.

D. Earthwork - Section 312000.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test. The basis of design

product listed herein is a component of the design test assembly selected by the Architect.

1.5 SUBMITTALS

A. Submit product data for each type of product indicated, including re-cycled content.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall be identical to approved samples.

C. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.

D. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART 2 PRODUCTS

2.1 FOUNDATION WALL AND UNDERSLAB INSULATION

A. Provide extruded polystyrene board insulation equal to "Foamular" manufactured by Owens Corning, or comparable product by Dow Chemical Co., or PACTIV Building Products, conforming to ASTM C 578, Type IV, with a maximum flame spread and smoke developed indices of 75 and 450 respectively.

B. Insulation shall have an aged R value of not less than 5/inch; shall be 2" thick unless otherwise noted on the drawings.

2.2 BATT INSULATION

A. Unfaced, Mineral-Wool Batt Insulation: ASTM C 665, Type I (batts without membrane facing); consisting of fibers; 2.5 pcf density, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

B. Reinforced-Foil-Faced, Glass-Fiber Batt Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim Kraft, or foil-scrim polyethylene.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 ACCESSORIES

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place. Provide "Series T TACTOO Insul-Hangers" by AGM Industries, Inc., "Spindle Type" by Gemco, or approved equal.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030" thick by 2" square.

2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105" in diameter; length to suit depth of insulation indicated.

3. Affix plate with stainless steel staple or screw.

B. Clips for Securing Insulation to Encountered Surfaces: Spindle anchor and washer type consisting of perforated metal plates with spindle welded to center and snap on washers. Spindle and washers shall receive a corrosion-resistant electro-zinc plating. Adhesives for securing clips in place shall be recommended by the approved clip manufacturer.

1. Acceptable Manufacturers

a. Miracle Adhesives Corp.
b. Stic-Klip Mfg. Co., Inc.
c. Midwest Fasteners

C. Insulation Flashing Tape: Provide insulation manufacturer's recommended board joint tape for sealing joints, seams and veneer tie penetrations through the insulation layer; Dow Chemical Co. "Weathermate" straight flashing, 4-inch width with butyl rubber adhesive, or equal.

D. Wall Opening Flashing: Provide insulated sheathing manufacturer's recommended flashing sealing window and door wall openings; Dow Chemical Co. "Weathermate" straight flashing, 6-inch and 9-inch width with butyl rubber adhesive at straight opening heads, jambs and sills, or equal.

E. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer, and complying with fire-resistance requirements.

1. For bonding rigid polystyrene insulation to masonry or concrete, provide adhesive equal to "Foamgrab PS" made by Dacor Products Co. or equal made by ChemRex Inc. or Miracle Adhesives.

F. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4" thick, formed under heat and pressure, standard sizes.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where thermal insulation is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION, GENERAL

A. Clean substrates of substances that are harmful to insulation including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

B. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

D. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. Extend insulation below exterior grade line to top of footing.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 36" in from exterior walls.

3.4 INSTALLATION OF BATT INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber or Mineral-Wool Batt Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced batts mechanically and support faced batts by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Batts: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction as indicated on Drawings.

3.5 INSTALLATION OF BOARD INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.

3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 INSTALLATION OF SPRAY FOAM INSULATION

A. Apply self-supported, spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

3.7 PROTECTION

A. Polyisocyanurate rigid foam board insulation from excess moisture, mechanical damage, and exposure to open flame.

B. Promptly repair damage caused to insulation in a manner that retains integrity and continuity of insulation and facer materials.

C. Keep polyisocyanurate boards dry and above job site water – keep tarped until ready to install.

D. Cover insulation with cladding promptly, but no later than 180 days after installation of insulation.

END OF SECTION 07210

SECTION 07 26 00

VAPOR RETARDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforced vapor retarders.

B. Tape to seal joints and repair vapor retarder.

C. Pipe boots for sealing penetrations.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM D 882 - Tensile Properties of Thin Plastic Sheeting.
2. ASTM D 1709 - Impact Resistance of Plastic Film by the Free-Falling Dart Method.
3. ASTM D 2582 - Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
4. ASTM D 3776 - Mass Per Unit Area (Weight) of Woven Fabric.
5. ASTM D 4833 - Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
6. ASTM E 84 - Surface Burning Characteristics of Building Materials.
7. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
8. ASTM E 1643 - Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
9. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

B. National Fire Protection Association (NFPA): NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

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. Samples: Submit manufacturer's samples of reinforced vapor retarders.

D. Verification Samples: For each product specified, two samples, minimum size 5 inches (125 mm) square, representing actual product.

1.5 QUALITY ASSURANCE

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before start of installation of reinforced vapor retarders. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and installer. Review installation, protection, and coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:

1. Store products in manufacturer's unopened packaging until ready for installation.
2. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Handling: Protect materials during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturer: Griffolyn, Division of Reef Industries, Inc., which is located at: 9209 Almeda Genoa Rd.; Houston, TX 77075; Toll Free Tel: 800-231-6074; Tel: 713-507-4251; Fax: 713-507-4295; Email: request info (ri@reefindustries.com); Web: https://www.reefindustries.com

B. Or approved equal - for substitutions considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 REINFORCED VAPOR RETARDERS

A. Reinforced Vapor Retarder: Griffolyn Type-65 G for use under concrete slabs; complying with ASTM E 1745 Class A.

1. Material: 4-ply laminate, combining 2 layers of high-density polyethylene and a high-strength non-woven cord grid with a layer of non-woven geotextile fiber.
2. Weight: 73 lb/1,000 sq ft (35.7 kg/100 sq m), when tested in accordance with ASTM D 3776.

3. Puncture Propagation Tear: 55 lb (245 N), when tested in accordance with ASTM D 2582.
4. Permeance (Perm): 0.038 grains/hr-sq ft-in Hg (2.18 ng/(Pa-s-sq m)), when tested in accordance with ASTM E 96.
5. Drop Dart: 2300 g, when tested in accordance with ASTM D 1709.
6. Tensile Strength: 160 lb/1,350psi (710 N/9.3 MPa), when tested in accordance with ASTM D 882, 3 inch (76 mm) wide specimen.
7. Puncture Strength: 60 lb (265 N), when tested in accordance with ASTM D 4833.
8. Classification: Class A, when tested in accordance with ASTM E 1745.
9. Usable Temperature Range: Minus 25 to 170 degrees F (minus 32 to 77 degrees C).
10. Application: Use under concrete slabs, over aggregate fill.

B.

2.3 ACCESSORIES

A. General: Ensure accessories are from same manufacturer as reinforced vapor retarders.

B. Mastic Tape: Griffolyn Fab Tape. RI Part Number: 60-0002.
1. Description: Black, double-sided, asphaltic, pressure-sensitive, mastic tape.
2. Weight: 3.75 pounds per 100 feet (1.7 kg per 30 m).
3. Thickness: 35 mils (0.9 mm).
4. 3 Inch Seam Shear: 35 pounds (156N).

C. Self-Adhesive Repair Tape: Griffolyn Sealant Tape RI Part Number: 60-0153.
1. Description: Reinforced white backing with Gray Adhesive.
2. Weight: 3.0 lbs for 4 inch x 50 foot roll.
3. Thickness: 26 mils (0.65 mm).
4. 3 inch Seam Shear: 30 lbs (134 N)

D. Fire Retardant Self-Adhesive Tape: Griff Tape FR RI Part Number 60-0151.
1. Description: White backed adhesive tape.
2. Weight: 3.75 lbs per roll, 4 inches x 180 feet long.
3. Thickness: 5 mils(0.125 mm).
4. Adhesion to Steel: 66 oz/in (18 N/in).

E. Pipe Boots: Griffolyn pipe boots, factory-fabricated.

F. Batten Strips: Manufacturer's standard for required application.

G. Fasteners: Manufacturer's standard for required application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas to receive reinforced vapor retarders. Notify Architect in writing of defects of work and other unsatisfactory site conditions that would cause defective installation of vapor retarders. Do not begin installation until unacceptable conditions have been corrected.

B. Verify site dimensions.

C. Commencement of work will imply acceptance of substrate.

3.2 INSTALLATION

A. Install reinforced vapor retarders in accordance with manufacturer's instructions.

B. Install reinforced vapor retarders in accordance with manufacturer's instructions and ASTM E 1643 at concrete slabs.

C. Install vapor retarders continuously at locations as indicated on the drawings. Ensure there are no discontinuities in vapor retarder at seams and penetrations.

D. Install vapor retarders in largest practical widths.

E. Ensure surface beneath vapor retarder is smooth with no sharp projections.

F. Join sections of vapor retarder and seal penetrations in vapor retarder with mastic tape. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.

G. Immediately repair holes in vapor retarder with self-adhesive repair tape.

H. Seal around pipes and other penetrations in vapor retarder with pipe boots in accordance with manufacturer's instructions.

3.3 PROTECTION

A. Protect reinforced vapor retarders from damage until covered by roof insulation.

B. Protect reinforced vapor retarders from damage until covered by wall finish.

C. Protect reinforced vapor retarders from damage during installation of reinforcing steel and utilities and during placement of granular materials or concrete slab.

D. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

END OF SECTION 072600

SECTION 072700

VAPOR-PERMEABLE AIR BARRIER LIQUID MEMBRANE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the vapor-permeable air barrier liquid membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Vapor-permeable/air barrier applied over concrete masonry units.

2. Materials and installation to bridge and seal the following air leakage pathways and gaps:

a. Connections of the walls to the roof.
b. Connections of the walls to the foundations.
c. Seismic and expansion joints.
d. Openings and penetrations of window frames, storefront, curtain wall.
e. Door frames.
f. Piping, conduit, duct and similar penetrations.
g. Masonry ties, screws, bolts and similar penetrations.
h. All other air leakage pathways in the building envelope.

1.3 RELATED SECTIONS

A. Unit Masonry - Section 042000.

1.4 SUBMITTALS

A. Provide evidence to the Architect of licensing and certification under the Air Barrier Association of America's (ABAA's) Quality Assurance Program.

B. Submit shop drawings showing locations and extent of air barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.

C. Submit manufacturer's product data sheets for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

D. Submit manufacturer's data showing solids content of fluid applied membranes and coverage rates and wet film thickness upon application in order to achieve minimum dry film thickness required by this specification.

E. Submit manufacturer's installation instructions.

F. Submit certification by air barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

G. Submit certification of compatibility by air barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it, including sealant as specified in Section 062000 for caulking joints between sheathing panels.

H. Test results of air permeability testing of primary air barrier material (ASTM E 2178).

I. Test results of assembly in accordance with ASTM E 2357.

J. Proof that the air barrier is part of an NFPA 285 approved wall assembly.

1.5 PERFORMANCE REQUIREMENTS

A. Provide air barrier constructed to perform as a continuous air barrier, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

B. Provide an air barrier assembly that has been tested in accordance with the Air Barrier Association of America's (ABAA's) approved testing protocol to provide air leakage results not to exceed 0.01 cfm/sf @ 1.57 psf as per ASTM 2357.

C. NFPA 285 Compliance.

D. Connections to Adjacent Materials: Provide connections to adjacent materials at the following locations and show same on shop drawings:

1. Foundation and walls, including penetrations, ties and anchors.

2. Walls, windows, curtain walls, storefronts, louvers or doors.

3. Different wall assemblies, and fixed openings within those assemblies.

4. Wall and roof connections.

5. Walls, floor and roof across construction, control and expansion joints.

6. Walls, floors and roof to utility, pipe, and duct penetrations.

7. Seismic and expansion joints.

8. All other leakage pathways in the building envelope.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA). The contractor shall carry liability insurance and bonding.

2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.

3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air barrier work on the project.

B. Single-Source Responsibility: Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Field-Constructed Mock-Ups in accordance with Quality Requirements Division 1: Prior to installation of air barrier, apply air barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:

E. Test mock-up in accordance with ASTM E 783 and ASTM E 1105 for air and water infiltration.

F. Manufacturer shall be on-site at least once a week to observe installation and provide written report within 3 days.

G. Manufacturer shall confirm all termination details and compatibility with materials being terminated to.

H. Preinstallation Conference: Conduct conference at the Project site. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Protect stored materials from direct sunlight.

C. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

D. Clean spills and leave area as it was prior to spill.

1.8 WARRANTY

A. System Warranty: Provide the manufacturer’s five (5) year system warranty, including the primary air barrier and installed accessory sealant and membrane materials which fail to achieve airtight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 MATERIALS

A. Liquid Membrane: "Air-Bloc 17MR Vapor Permeable Fluid-Applied Membrane" by Henry Company, "Perm-A-Barrier VP" by GCP Applied Technologies or equal products by Tremco. WR Meadows, or approved equal. Trade names used herein are those of Henry Company.

B. Sheet Transition Membrane: Blueskin SA or Blueskin VP 160.

C. Window and Door Opening Flashing: Self-adhesive air and vapor barrier membrane; Blueskin SA or Metal Clad.

D. Liquid Applied Flashing: Henry Air-Bloc LF.

E. Primer for Blueskin: Blueskin LVC Adhesive.

F. Air Barrier Sealant: HE 925 BES Sealant.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where vapor-permeable air barrier liquid membrane is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the work.

3.2 SURFACE PREPARATION

A. All surfaces must be sound, dry, clean, and free of oil, grease, dirt, excess mortar or other contaminants.

B. Cracks in masonry and concrete up to 2" wide shall be filled with a trowel application of Liquid Applied Flashing or Sealant and allowed to skin over prior to application of the fluid-applied membrane to the surface. Alternatively, the cracks may be sealed with a strip of Transition Membrane applied to the substrate.

C. Surfaces shall be tied in with beams, columns, etc. using strips of Transition Membrane lapped a minimum of 3" on both substrates. Mechanical attachment should be made to all window and door frames, or a properly designed sealant joint provided.

3.3 TRANSITION MEMBRANE

A. Align and position self-adhering transition membrane, remove protective film and roll firmly into place with heavy roller. Ensure minimum 2" overlap at all ends and side laps.

B. Tie-in to window frames, metal door frames, etc., and at the interface of dissimilar materials as indicated on the Drawings.

C. Promptly roll all laps and membrane with a countertop roller to effect seal.

D. Ensure all preparatory work is complete prior to applying Liquid Applied Membrane.

3.4 FLUID-APPLIED MEMBRANE APPLICATION

A. Apply fluid-applied membrane to wall substrates in a continuous coat at manufacturer’s recommended rate by spray or trowel to provide a minimum wet film thickness of 0.090" (90 mils) for rough surfaces like CMU and 0.070" (70 mils) for smooth sheathing.

1. Minimum dry film thickness shall be 0.048" (48 mils) on CMU and 0.037" (37 mils) on smooth sheathing.

B. Overlap liquid membrane on to transition membrane at connections a minimum of 1".

C. Apply fluid-applied membrane around masonry ties to ensure a complete seal.

D. Do not leave membrane exposed for any longer than 180 days.

E. Penetrations: Seal all penetrations with Liquid Applied Flashing or Sealant or other procedures in accordance with manufacturer’s instructions.

3.5 PROTECTING AND CLEANING

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Protect air barrier from exposure to the elements as required by the manufacturer.

D. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

1. Schedule work to ensure that the air and vapor barrier system is covered as soon as possible after installation. Protect air and vapor barrier system from damage during subsequent operations. If the air and vapor barrier system cannot be permanently covered within 180 days after installation, apply temporary UV protection.

3.6 FIELD QUALITY CONTROL

A. Air Barrier Association of America Installer Audits: Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site inspections by ABAA to verify conformance with the material Manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

1. Audits and subsequent testing shall be carried out at the following rate:

a. Up to 10,000 ft^2 of air barrier contract requires one (1) audit.
b. 10,001 – 35,000 ft^2 of air barrier contract requires two (2) audits.
c. 35,001 – 75,000 ft^2 of air barrier contract requires three (3) audits.
d. 75,001 - 125,000 ft^2 of air barrier contract requires four (4) audits.
e. 125,001 – 200,000 ft^2 of air barrier contract requires five (5) audits.
f. 200,001 ft^2 and over of air barrier contract requires six (6) audits.

2. Forward written audit reports to the Architect within 10 working days of the inspection and test being performed.

3. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

B. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.

2. Remove and replace deficient air-barrier components for retesting as specified above.

C. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

END OF SECTION 072700

SECTION 074113

METAL ROOF PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the metal roofing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Metal roof system.
2. Closure, flashing, trim, caps, roof edges, gutter, and related sheet metal work.
3. Nailable roof insulation.
4. Snow guards.
5. Supports and accessories.

1.3 RELATED SECTIONS

A. Structural Steel Framing - Section 051200.

B. Carpentry - Section 062000.

1.4 REFERENCES

A. ASTM A 463, steel sheet, zinc-coated (galvanized) by the hot dip process, structural physical quality.

B. ASTM A 653, steel sheet, zinc-coated by the hot dip process.

C. ASTM A 792, steel sheet, aluminum-zinc alloy coated.

D. ASTM B 209, aluminum and aluminum alloy sheet and plate.

E. ASTM E 1592, Test Method for Structural Performance of Sheet Metal Roofing and Siding Systems by Uniform Air Pressure Difference.

F. SMACNA, Architectural sheet metal manual.

1.5 QUALITY ASSURANCE

A. Manufacturer shall have had at least ten (10) years' experience in architectural roofing and the roof systems shall have been in use for at least ten (10) years. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.

B. The installer shall be authorized by the manufacturer, and the actual work shall be supervised by personnel trained by the manufacturer in proper application of the product. The installer shall have capability for preparation of shop details and fabrication of all flashings not furnished by the panel manufacturer.

1.6 SUBMITTALS

A. Shop Drawings: Shop drawings must be in scale large enough to clearly show all details. Include dimensions of fabricated work, reference dimensions to the structure, type, size and spacing of fasteners, material thickness and finishes, plan layout with erection sequence and coordination required with other trades. Shop drawings must be reviewed and approved by the Architect prior to commencement of work.

B. Manufacturer's Data: Submit for information only, metal manufacturer's specifications, installation instructions and general recommendations for roofing applications. Include manufacturer's certification or other data substantiating that the materials comply with the requirements and are adequate to support roof loads as required by Code. Indicate by copy of transmittal that the Fabricator/Installer has received copy of manufacturer's instructions and recommendations.

C. Samples: Submit 12" square samples of each specified metal and gauge to be used on roofing. Samples will be reviewed by Architect for thickness and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

D. Submit certification indicating manufacturer's experience qualifications.

E. Engineering Data: Submit engineering and test data and tables showing performance characteristics of the panels for loads, deflections and infiltration of air and water meeting standards specified herein.

1.7 PERFORMANCE REQUIREMENTS

A. Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 4.0 lbf/sq. ft.

C. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a

minimum differential pressure of 20 percent of inward acting, wind load design pressure of not less than 6.24 lb./sq. ft and not more than 12.0 lb./sq. ft.

D. Metal roof assembly shall be capable of passing ASTM E 1592 testing without failure of any kind when subject to wind uplift pressure as required by Code.

E. System shall conform to ASCE 7 standard.

1.8 PRODUCT HANDLING

A. Protection: Protection shall be provided during fabrication, shipment, storage and erection. During shipment, finished surfaces shall be protected from abrasion by a removable plastic film between areas of contract. Job site storage shall be in a clean, dry area out of direct contact with the ground, under cover or sloped for drainage, protected from abuse by traffic and from contamination by corrosive or staining materials. Stored materials and unfinished work shall be secured against wind damage. Installed panels shall be protected from abuse by other trades.

1.9 WARRANTY

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect a written warranty signed by the Roofing Contractor, and endorsed by the roofing materials manufacturer guaranteeing that the installed roofing will remain intact and free from leaks for a period of at least twenty-five (25) years.

B. Paint finish shall have a twenty-five (25) year guarantee against cracking, peeling and fade.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal roof shall be UNA-CLAD "UC-6," standing seam roof system as manufactured by Elevate, or approved equal by ATAS, PAC-CLAD, or Berridge Manufacturing, or other manufacturer acceptable to the architect.

2.2 METAL ROOFING

A. Provide 22-gauge AISI-G90 zinc-coated, galvanized steel sheet conforming to ASTM A653, G90 coating designation, structural quality, prepainted by the coil-coating process to comply with ASTM A755.

1. Surface: Smooth, flat finish.

B. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.

1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and

fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.

2. Color: As selected by the Architect.

C. Standing seam roof panels shall be site formed, and panel assembly designed for concealed mechanical attachment of panels to deck.

1. Provide minimum 0.0625" thick, stainless steel panel clips designed to meet negative load requirements.

2. Provide concealed fastener floating interlock for double lock seam.

3. Mechanically seamed cleats formed from minimum 0.0250" thick, stainless steel or nylon coated aluminum sheets.

2.3 POLYISOCYANURATE BOARD INSULATION

A. Polyisocyanurate Board Roof Insulation, Nailable: Provide 7" thick rigid, cellular thermal insulation with polyisocyanurate closed-cell foam core bonded to 7/16" thick OSB on the top side and a fiber-reinforced felt facer on the bottom side; equal to "ACFoam Nail Base" as manufactured by Atlas Roofing Company, or equal, complying with ASTM C 1289, Type V, average LTTR value as designated at mean temperatures indicated after testing per ASTM C 1303 as follows:

1. LTTR R-Value: 6.0/inch at 75 deg. F.

2. Surface Burning Characteristics: Maximum flame spread of 25.

2.4 MISCELLANEOUS MATERIALS

A. Provide components required for a complete roof panel assembly including trim, copings, fascia, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.

2. Sealing Tape: Pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape.

3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer. Sealant shall be compatible with membrane.

4. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance.

Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

5. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96" long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36" o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match roof panels.

6. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot-long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

7. Snow Guards: Provide "ColorGard" as manufactured by S-5!, non-penetrating, seam-mounted, clip-on, rail-type snow guards, compatible with preformed metal roofing system and factory-finished to match adjacent metal roofing system finish.

B. Fasteners shall be self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Use stainless steel fasteners for all exterior applications and galvanized steel fasteners for interior applications.

C. Self-Adhering, High-Temperature Underlayment (throughout): Provide "CLAD-GARD™ SA" by Holcim Elevate, or approved equal; a self-adhering, cold-applied, sheet underlayment, minimum 40 mils thick, consisting of a slip-resistant, woven polyethylene top surface laminated to a layer of SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer. Provide double layer of Underlayment around all roof penetrations and along all roof edges and junctures (for the width of the roll @ 36”).

1. Thermal Stability: Stable after testing at 250°F (121°C); ASTM D1970.

2. Low-Temperature Flexibility: Passes after testing at -22°F (-30°C); ASTM D1970.

D. Provide 1/2" (minimum) cement board mechanically attached to metal deck to accept vapor barrier.

E. Provide vapor barrier below insulation, shown on elevation. Carlisle VapAir Seal 750 or equal (option Vapair seal MD, direct to metal deck, screw through.

F. Bituminous coating shall be cold applied asphalt mastic, SSPC - Paint 12, compounded for 15 mil dry film thickness per coat. Provide inert type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 PANEL SUPPORTS AND ANCHORAGE

A. Miscellaneous Metal Subframing and Furring (as detailed): ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653, G90 coating designation or ASTM A 792, Class AZ50 coating designation unless otherwise indicated. Provide

manufacturer's standard sections as required for support and alignment of metal panel system on plywood substrate.

2.6 FABRICATION

A. Comply with dimensions, profile limitations, gauges and fabrication details shown on drawings and specified herein.

B. Fabricate components and assembly units to comply with performance requirements specified.

C. Apply specified finishes in conformance with manufacturer's standards, and according to manufacturer's instructions.

D. In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

E. Materials used shall be of such strength, thickness, and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the metal roof systems are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for assembly, installation, and erection of roof systems.

B. Fasten cement board to deck in accordance with FM approved assembly, followed by applying vapor barrier to entire surface.

C. Metal Separation: Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact.

D. Adhere insulation to vapor barrier and cement board following FM guidelines.

E. Anchor component parts securely in place, providing for necessary thermal and structural movement.

F. Joint Sealers: Install gaskets, joint fillers and sealants where required for weatherproof performance of system. Provide type of gaskets and sealants/fillers recommended by manufacturer.

G. Installation of Metal Roof Panels

1. Conform to standards set forth in the SMACNA architectural sheet metal manuals and manufacturer's recommendations.

2. Install panels so that they are weathertight, without waves, warps, buckles or distortions, and allow for expansion and contraction.

3. Caulk all flashing and panel joints that require caulking to prevent water penetration.

4. Horizontal Seams: Horizontal seams are not permitted. Panels must be roll-formed to full roof lengths on-site or delivered to the site as continuous lengths to eliminate horizontal seams.

5. Standing Seams: Standing seams shall be field-formed using manufacturer-recommended mechanical seaming equipment.

6. Remove any strippable film immediately upon installation.

H. Damaged Material: Remove and replace panels and component parts of the work that are damaged beyond successful repair, including damage to finishes, as directed by the Architect. Repair minor damage.

I. Clean exposed surfaces of metal panels promptly after completion of installation. Comply with recommendations of the manufacturer.

END OF SECTION 071400

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 074246

CONCRETE PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ultra high performance concrete (UHPC) fabrications, as indicated on drawings and specified herein including, but not limited to, the following:

1. UHPC façade panels.

2. Extruded aluminum support system.

3. Attachment hardware and accessories.

4. All cast-in angle clips for attaching to back-up support system shall be stainless steel.

1.3 RELATED SECTIONS

A. Thermal Insulation - Section 072100.

B. Vapor-Permeable Air Barrier Liquid Membrane - Section 072700.

C. Sheet Metal Flashing - Section 076200.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer of ultra high performance cement panels shall be a firm which successfully fabricated UHPC components specified for a period of not less than five (5) years and is equipped to provide the quality and quantity shown. Manufacturing plant shall be certified by the Prestressed Concrete Institute.

B. Mock-Up: Provide on-site composite mock-ups as directed by the Architect, including adjacent connected construction.

1.5 ULTRA HIGH PERFORMANCE CONCRETE PERFORMANCE CRITERIA

A. The components and assemblies of the UHPC components system shall comply with the Codes and regulations of all Governing Agencies having jurisdiction. When applicable Codes or specified requirements differ, the more stringent conditions shall be provided for. Except when applicable codes make other provisions, or as otherwise

noted herein, the loads shall act in combinations that provide the most unfavorable conditions.

B. Wind Loads: The wind loads on the UHPC components and its connections shall be positive and negative per window Section.

1. Design Wind Pressure shall be multiplied by a Load Factor of 1.50. With this Load Factor applied, design stresses shall not exceed yield point level or elastic buckling level, whichever is lower. No wall element, including sealants and sealed joints, shall sustain permanent deformation or failure under loading equivalent to 1.5 times the Design Wind Pressures.

2. Stresses shall not exceed the allowable values established and recommended by Prestressed Concrete Institute. In no case shall allowable values exceed the yield stress. For load combinations, a reduction in load or increase in allowable stress (but not both) may be used only if permitted by code.

1.6 SUBMITTALS

A. Product Data: Submit specifications and other data for each type of UHPC required, including certification that type complies with specified requirements. Include instructions for handling, storage, installation, protection and cleaning.

B. Samples: Submit sets of samples of each different color, grade and finish. Include in each set full range of exposed color and texture to be expected in completed work, 24 by 24 inches and of actual thickness.

C. Project -Specific Shop Drawings: Submit cutting and setting drawings showing sizes, dimensions, sections and profiles of UHPC units, arrangement and provision for jointing, anchoring, and fastening, supports and other necessary details for lifting devices and reception of other work, including the following:

1. Provide layout of engineered bracket and rail support system to be coordinated with cold-formed metal framing.

2. Provide 1/4"=1'-0" elevation drawings and plan layout drawings, fully dimensioned and referenced to column lines. Details shall be minimum of 3"=1'-0" scale, and shall indicated all fully coordinated adjacent construction.

3. Unit shapes (elevations and sections) and dimensions.

4. Thickness of facing and UHPC backing.

5. Finishes.

6. Steel stud frame details.

7. Joint and connection details. Include complete integrated aluminum plate trim indicating joints, connections, corner conditions, etc.

8. Lifting and erection details.

9. Location and details of hardware attached to structure.

10. Size, location and details of lateral and gravity anchors.

11. Handling procedures.

12. Sequence of erection for special conditions.

13. Relationship to adjacent material.

14. Description of all loose, cast-in, and field hardware.

15. Each piece of panel shall be dimensioned and numbered. The numbers shall correspond to the numbers on the approved setting drawings.

D. The manufacturer shall not proceed with fabrication of any products prior to receiving approval of samples and erection drawings by the Architect.

E. Engineering Calculations: Submit engineering and design calculations to substantiate the anchoring methods, fastening devices, and substructure assembly components of the rainscreen system, and all UHPC indicated on the submitted shop drawings, signed and sealed by a Professional Engineer licensed in the State of New York.

1. Calculations shall establish compliance with specified stress at all principal elements and the structural analysis of all connections. If calculations indicate any deficiencies, provide all items necessary to comply with the performance requirements without cost to the Owner.

2. Calculations shall be submitted on 8-1/2" x 11" sheets and shall be signed and sealed by a professional engineer registered in the State of New York.

3. The general design shown is presumed adequate to permit compliance with the specified performance. Provide details and calculations as necessary to verify and supplement the general design.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling

1. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses or damage.

2. Lift or support units only at the points shown on the erection shop drawings.

3. Place nonstaining resilient spacers of even thickness between units.

4. Support units during shipment on nonstaining, shock-absorbing material.

5. Protect units from dirt and damage during handling and transport.

B. Storage at Job Site

1. Store units to protect them from contact with soiling, staining, and from physical damage.

2. Store units, unless otherwise specified, with nonstaining, resilient supports located in same positions as when transported.

3. Store units on firm, level, and smooth surface.

4. Place stored units so that identification marks are easily readable.

1.8 TESTING

A. The following tests shall be performed:

1. Concrete compressive strength according to ASTM C 39. Use specimens 3" x 6". These tests shall be performed at 40 hours, after curing at 72°F for each batch.

2. Determination of flow according to ASTM C 109 performed on a flow table constructed according to ASTM C 230. Inform the Owner if the measured diameter of the concrete after 20 table drops is outside of the following limits: minimum 7"; maximum 8-1/2". Perform the test on every concrete batch.

PART 2 PRODUCTS

2.1 UHPC PANELS

A. UHPC Façade Panels: Standard + by TAKTL and as indicated on Drawings.

2.2 PERFORMANCE CHARACTERISTICS

A. Compressive Strength: ≥ 18,275 lbs./in2 (126 MPa).

B. Flexural Strength: ≥ 2,756 lbs./in2 (19 MPa).

C. Tensile Strength: 1,160 lbs./in2 (8 MPa).

D. Water Absorption: < measurable limit (kg/m x h0.5) 3.5%.

2.3 PIECE FORMING AND CONCRETE CURING:

A. All pieces shall be formed from same batch of integrally colored UHPC.

B. The design and fabrication of forms shall satisfy the requirements of the imposed dimensional tolerances, influence of concrete shrinkage and tightness of forms. The joint leakage of the concrete shall be prevented in order to ensure that each panel is cast using one concrete batch. Cold joints are not permitted. Submit the form fabrication drawing for review.

C. Method of reinforcement and inserts to form attachments, concrete placing and vibration shall be included in the manufacturing procedure submitted to the Architect for approval.

D. The concrete in the form shall be cured during 24 hours at a temperature of 86°F +/- 10°F (20°F +/- 5°F). The forms shall be covered with plastic sheeting and the concrete shall be kept moist

E. Fasteners and Inserts: The manufacturer shall cast in pipes as detailed on the contract drawings.

F. NOTE: Perforations are to be in TAKTL panels through which

2.4 FABRICATION TOLERANCES

A. Manufacturing Tolerances: Manufacture UHPC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

B. Manufacturing Tolerances: Manufacture UHPC panels so each finished unit complies with the following dimensional tolerances. For dimensional tolerances not listed below, comply with PCI MNL 130.

1. Overall Height and Width of Units, Measured at the Face Adjacent to Mold: As follows:

   a. 10 feet (3 m) or less, plus or minus 1/8 inch (3 mm).
   b. More than 10 feet (3 m), plus or minus 1/8 inch per 10 feet (3 mm per 3 m); 1/4 inch (6 mm) maximum.

2. Edge Return Thickness: Plus 1/2 inch (13 mm), minus 0 inch (0 mm).

3. Architectural Facing Thickness: Plus 1/8 inch (3 mm), minus 0 inch (0 mm).

4. Backing Thickness: Plus 1/4 inch (6 mm), minus 0 inch (0 mm).

5. Panel Depth from Face of Skin to Back of Panel Frame or Integral Rib: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

6. Angular Variation of Plane of Side Mold: Plus or minus 1/32 inch per 3 inches (0.8 mm per 75 mm) of depth or plus or minus 1/16 inch (1/5 mm) total, whichever is greater.

7. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches (3 mm per 1800 mm) or plus or minus 1/4 inch (6 mm) total, whichever is greater.

8. Local Smoothness: 1/4 inch per 10 feet (6 mm per 3 m).

9. Bowing: Not to exceed L/240 unless unit meets erection tolerances using connection adjustments.

10. Length and Width of Block Outs and Openings within One Unit: Plus or minus 1/4 inch (6 mm).

11. Location of Window Opening within Panel: Plus or minus 1/4 inch (6 mm).

12. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches (1.5 mm per 300 mm) of distance from nearest adjacent corner.

C. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.

1. Panel Frame and Track: Plus or minus 1/4 inch (6 mm).

2. Flashing Reglets at Edge of Panel: Plus or minus 1/4 inch (6 mm).

3. Inserts: Plus or minus 1/2 inch (13 mm).

4. Special Handling Devices: Plus or minus 3 inches (75 mm).

5. Location of Bearing Devices: Plus or minus 1/4 inch (6 mm).

6. Blockouts: Plus or minus 3/8 inch (10 mm).

D. Panel Frame Tolerances: As follows:

1. Vertical and Horizontal Alignment: 1/4 inch per 10 feet (6 mm per 3 m).

2. Spacing of Framing Member: Plus or minus 3/8 inch (10 mm).

3. Squareness of Frame: Difference in length of diagonals of 3/8 inch (10 mm).

4. Overall Size of Frame: Plus or minus 3/8 inch (10).

2.5 WALL SUPPORT FRAMING SYSTEM

A. Basis of Design: "NV1" by NVelope Rainscreen Systems Ltd.

B. Gauge, Configuration, Dimensions, and Spacing: Minimum gauge and as required to conform to design criteria for each assembly.

C. Material: Alloy 6005A T6 appropriate for rainscreen cladding support and construction; finish as selected by the Architect.

D. Wall Brackets

1. Single brackets have a height of 75 mm and the double brackets, 150 mm Pre-Punched Holes: For minimum two wall anchors per bracket.

2. Stem for Connecting Rail to Bracket:

a. Small bracket dimensions: 3 inch (h) and 2.5 inch (w). Plate thickness: 4mm Pre-punched bracket to substrate fastener holes of 6.5mm for steel and wood frame, 11mm for concrete or CMU substrate.
b. Large bracket dimensions: 6 inch (h) and 2.5 inch (w). Plate thickness: 4mm Pre-punched bracket to substrate fastener holes of 6.5mm for steel and wood frame, 11mm for concrete or CMU substrate.
c. Pre-punched Holes: For easy engagement and placement of stainless steel self- tapping hex-head screws for use in attaching vertical rail to wall bracket.

3. Dimensions: As needed to offset cladding from wall plane where meeting substrate and to allow for installation of insulation equal in thickness to offset.

    a. Offset Brackets: 40mm, 60mm, 90mm, 120mm, 150mm, 180mm, 210mm, 240mm, 270mm, 300mm depths with up to 40mm of adjustment on the vertical axis.
        1). Align offsets to differing wall planes as shown on Drawings.

4. Recommended Product: Nvelope Thermal Isolator.

E. Vertical Rail: Minimum 2.2 mm thick extruded aluminum.

1. Profile: L rail for vertical furring members.

2. Nominal Dimensions: 60mm leg and 40mm leg.

3. Profile: T-section for vertical furring members.

4. Nominal Dimensions: (T60-80) 60mm leg and 80mm face. (T60-100) 60mm leg and 100mm face. (T40-100) 40mm leg and 100mm face. (T60-120) 60mm leg and 120mm face. (T60-140) 60mm leg and 140mm face.

5. Profile - U-Section: (HBL60-40) 60mm leg and 40mm face. 2.5 mm thickness.

6. Profile - Z-Section: (Z25-45-30) 25mm face and 45mm leg and 30mm face. (Z40-45-55) 40mm face and 45mm leg and 55mm face. 2.4 mm thickness.

F. Thermal Barrier

1. Material: Injection molded Polypropylene copolymer.

2. Size: To accommodate plate.

    a. Framing Member to Framing Member Isolation: Minimum 0.125 inch thick.
    b. Isolator must match support bracket and must not decrease structural performance of system.

3. Product: NV-T1 or NV-T2 Thermal Isolators by NVelope USA, LLC, or approved equal, , or recommended by system manufacturer.

G. Connectors and Anchors

1. All connectors shall be concealed behing panel (not exposed).

2. Connectors used with Cold-Formed Steel Framing Members: Conform to ICC ES AC261.

3. Screw Fasteners: Stainless steel as instructed by manufacturer.

    a. Thermoset Polyester coating that exhibits 1,000 hours of salt spray beyond stainless steel anti-corrosiveness.
    b. Minimum No. 14 self-drill hex-head screw fastener to be used to attach horizontal rail to vertical rail.

c. Steel Studs:
1). Self-drill hex-head TEK screw fasteners of sufficient length.
2). Minimum three threads must penetrate steel stud members.

4. Concrete and Masonry Wall Anchors: Mechanical and Adhesive anchors, bolts, nuts, and washers suited to use and as required for transference of design loads.

a. Mechanical Anchors: Expansion type, conforming to ICC ES AC193.
b. Adhesive Anchors: Torque Controlled, conforming to ICC ES AC308.

H. Accessories

1. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness as necessary to meet structural requirements for special conditions encountered.

2. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

2.6 FINISHES

A. Finish exposed-face surfaces of UHPC as follows to match approved samples and mock-ups. Submit samples for color match review in mock-up construction. Panel faces shall be free of joint marks, grain, or other obvious defects.

1. Colors: ‘Titanium’ (63) and ‘Graphite’ (40).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for environmental conditions, installation tolerances, and other conditions affecting performance of ultra high performance concrete fabrications.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prior to installation of units, the Contractor shall check the job site dimensions affecting the work. Any discrepancies between design dimensions and field dimensions that could adversely affect installation in accordance with the contract documents shall be brought to the attention of the Architect. Installation shall not proceed until discrepancies are corrected or until installation requirements are modified and reviewed by the Architect.

B. Examine UHPC components prior to installation.

1. Any piece with flaws, imperfections, dimensional errors, improper tolerances, damage, discolorations, staining, or otherwise not considered suitable and/or acceptable to the Architect, will be subject to rejection.

2. Defective items shall be removed from the job site and replaced to the Architect's satisfaction within 48 hours. Repairs, such as gluing of broken units are not to be allowed.

C. Touch up galvanized steel surfaces, which are scratched or damaged, with zinc-rich paint and/or approved "Galvanize Repair" paint products. Clean metal thoroughly before touch up.

3.3 INSTALLATION

A. Contiguous Work: Provide openings and other provisions as shown or required for contiguous work. When directed by the Contractor, close up openings in units after other work is in place. Use materials and set to match surrounding units.

B. Setting: Set UHPC units in accordance with drawings and final shop drawings. Provide anchors, supports, fasteners and other attachments shown or necessary to secure work firmly in place. Shim and adjust accessories for proper setting of units.

1. Make necessary provisions for the employment of the suitable lifting devices at points provided by the manufacturer.

2. Erect UHPC units plumb and true with joints uniform in width and accurately aligned within the allowable tolerances.

3. Provide temporary supports and bracings as required to maintain position, stability and alignment when units are being permanently connected. Fasten UHPC units in place by bolting or welding or both as shown on approved erection drawings.

a. Provide slotted holes in connection and attachments to accommodate induced panel movement due to creep, thermal, moisture, field tolerances and dimensional changes in the structural frame.

3.4 CONSTRUCTION TOLERANCES

A. Install UHPC units to comply with the following noncumulative maximum variations:

1. Tolerance of Face Width of Joint

a. Panel Dimensions 10 Feet or Less: + 3/16"
b. Panel Dimensions 10 to 20 Feet: + 1/4"
c. Panel Dimensions Over 20 Feet: + 5/16"

2. Warpage: Maximum permissible warpage of one corner out of the plane of the other three shall 1/16 inch/ft. distance from the nearest adjacent corner, or 1/4" total after installation.

3. Bowing: Not over L/360 with a maximum of 1", where L is the panel length in the direction of the bow. Differential bowing as erected between adjacent members of the same design shall be not more than 1/4".

3.5 ADJUSTMENTS AND CLEANING

A. Remove and replace units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining work. Provide new matching units, install as specified and eliminate evidence of replacement.

B. Clean UHPC units not less than 6 days after completion of work, using clean water and stiff-bristle brushes. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers.

C. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures work being without damage, discolorations, or deterioration during subsequent construction and until time of substantial completion.

END OF SECTION 074246

SECTION 074616

ALUMINUM SIDING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum siding as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Aluminum siding.
2. Aluminum trim.
3. Fasteners and accessories.

1.3 RELATED SECTIONS

A. Vapor-Permeable Air Barrier Liquid Membrane - Section 072700.

B. Sheet Metal Flashing - Section 076000.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use single source design and build manufacturer who is thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1. For actual installation of siding, use only competent and skilled workers completely familiar with the products and the manufacturer's currently recommended methods of installation.
2. Installer: A firm that can show proof of prior successful experience with the installation of metal siding of similar type and equivalent scope.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by the Architect.
2. Do not proceed with remaining work until workmanship, color, and gloss are approved by the Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.5 PERFORMANCE CRITERIA

A. Structural Design: Design calculations certified by a registered professional engineer licensed in New York shall be submitted to verify load-bearing capability of panel system. Panel system shall be capable of resisting a minimum positive and negative wind load as required by ASCE-7 or prevailing code, whichever is more stringent, without exceeding a deflection of L/180.

B. Air Infiltration: 0.06 CFM/sq. ft. air leakage under a static pressure of 1.57 psf when tested in accordance with ASTM E 283.

C. There shall be no uncontrolled water penetration to the building interior when the wall panel system is tested per ASTM E 331 at a positive pressure differential of 6.24 psf or 20% of the design wind pressure whichever is greater. The test pressure need not exceed 12 psf.

D. Accommodate movement within system without damage to components or movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.

E. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

1.6 SUBMITTALS

A. Manufacturer's Data: Submit for information only, metal manufacturer's specifications, installation instructions and general recommendations for wall cladding applications. Include manufacturer's certification or other data substantiating that the materials comply with the requirements. Indicate by copy of transmittal that the Fabricator/ Installer has received copy of manufacturer's instructions and recommendations.

B. Samples: Submit 12" square samples of each specified metal and gauge to be used on siding. Samples will be reviewed by Architect for compliance with thickness, texture, and finish requirements only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

C. Shop Drawings: Submit shop drawings showing the manner of forming, jointing, and securing the metal work. Shop drawings shall be coordinated and show surrounding work and shall be promptly updated throughout the project as architectural drawings and shop drawings from other trades are updated.

D. Structural calculations: Submit structural calculations signed and sealed by a Professional Engineer licensed in the State of New York.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 WARRANTY

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect a written warranty signed by the Siding Contractor and endorsed by the siding materials manufacturer warranting that the installed siding will remain intact for a period of at least fifteen (15) years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Longboard Architectural Products, or approved equal by Knotwood, Dizal, or Architectural Panel Systems or other manufacturer acceptable to the architect.

2.2 MATERIALS

A. Extruded Aluminum Siding and Soffits: Longboard 6-Inch V-Groove Planks, extruded aluminum 6063-T5.

1. Finish Coating: Powder coated finish.

2. Color: As selected by the Architect.

3. Gloss: 30 ± 5.

4. Thickness: 1.52 mm base metal thickness.

5. Profile: 6 inch (152.4mm) V-groove 24 ft. (7315.2mm) plank.

2.3 ACCESSORIES

A. Exposed Trim: Inside corners, outside corners, wide starter strip, J-track, flat-cap and base, U-cap and base, finishing-cap and base, two-piece corner, perforated 2.5 vent strip, 2.5 nonperforated strip in same material and finishes as siding.

2.4 DISSIMILAR METALS PROTECTION

A. Where possible, contact between dissimilar metal surfaces shall be avoided. Where contact occurs, notify the Architect who shall advise the Contractor how best to isolate the surfaces, as follows:

1. Painting with:

a. Bituminous paint complying with FS-TT-C-494, Type II, 12 mils dry film thickness.
b. Zinc chromate primer, alkyd, complying with FS-TT-P-645.

2. Taping or gasketing with a non-absorptive material.

3. Caulking the joint between the 2 metals using sealant specified herein.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where aluminum siding is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General: Comply with panel manufacturer's instructions for assembly, installation, and erection of aluminum siding.

B. Use Hex Head #10 self-drilling screws for exterior use. Fasten the first 'L' piece directly to the supporting structure (aluminum sub-girts) 32" o.c. If the wall is more than 24'-0" long, leave a 1/4" gap between butt joints for expansion and contraction. Snap on second 'L' piece using a hammer and block. Snap on end caps to both ends of the 2-piece beam. Secure with a hammer and block.

C. Damaged Material: Remove and replace panels and component parts of the work which have been damaged (including finish) beyond successful repair, as directed by the Architect. Repair minor damage.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces of custom metal siding work promptly after completion of installation. Comply with recommendations of panel manufacturer.

B. Protection: The Installer of aluminum siding shall advise the Contractor in writing of protection procedures that can be anticipated as needed to ensure that the work will be without damage or deterioration at the time of final acceptance after completion of other construction work.

END OF SECTION 074616

SECTION 076200

SHEET METAL FLASHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet metal flashing as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Stainless steel cap metal flashing.
2. Field fabricating (including bending, cutting, soldering, etc.), if required, of stainless steel flashing.
3. Stainless steel flashing elsewhere, where metal flashing is indicated on drawings.
4. Separation of contacting surfaces of dissimilar metals.

1.3 RELATED SECTIONS

A. Unit Masonry - Section 042000.

B. Concrete Panels - Section 074246.

C. Roofing - Division 7.

1.4 SUBMITTALS

A. Shop Drawings: Submit, showing all materials, finishes, fastenings, joint details, fabrication, construction, and relation to adjoining construction.

B. Samples: Submit 12" x 12" samples of flashing materials and finishes.

1.5 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

1.6 WARRANTY

A. The Contractor shall warrant that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel Flashing Materials

1. Stainless Steel Flashing: ASTM A 240, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, or Washington Steel Corp. Thickness of stainless steel shall be as listed below.

a. Concealed Flashings: 0.012" thick, thirty (30) gauge (U.S. Standard).
b. Exposed Flashings: 0.015" thick, twenty-eight (28) gauge (U.S. Standard).
c. Edge Strips: 0.025" thick, twenty-four (24) gauge (U.S. Standard).

2. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.

3. Solder: Composed of sixty (60) percent block tin and forty (40) percent pig lead, except that solder at seams exposed to public view shall be eighty (80) percent tin and twenty (20) percent lead.

4. Flux: An acid type flux manufactured specifically for soldering stainless steel, as approved.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where sheet metal flashing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 METAL FLASHING INSTALLATION

A. Reference Standard: Conform to the requirements of 7th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual.

B. General: Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.

C. Nailing: Confine to sheets twelve (12) inches or less in width. Confine nailing to one edge only, locate nails where concealed. Use No. 12 x 1" long flat headed, annular threaded, Type 302 stainless steel nails for nailing to wood blocking; use one (1) inch long masonry nails for nailing to concrete. Space nails four (4) inches o.c. maximum.

D. Cleating: Use cleats where sheets are more than twelve (12) inches in width. Space cleats approximately twelve (12) inches o.c. Cleats two (2) inches wide by three (3) inches long, of the same material and weight as the metal flashing being installed. Secure one end of the cleat with two (2) nails and fold edge back over the nail heads. Lock other end into seam or into folded edge of metal flashing sheets. Pre-tin cleats for soldered seams.

E. Joining: Join metal flashings with one (1) inch locked and soldered seams except at slip joints. Mallet seams flat and solder full length of seam as specified below.

F. Soldering: Clean and pre-tin edges of metal flashing to be soldered before soldering is begun with solder on both sides for a width of not less than 1-1/2". Solder slowly with well heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount of flux brushed in before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.

G. Slip Joints: Locate slip joints not more than twenty-four (24) feet apart and not more than eight (8) feet from corners. Form slip joints as three (3) inch wide joints with cover piece behind flashing and fill locked ends neatly with sealant.

H. Cap Flashing: Install over base flashings, in eight (8) to ten (10) foot lengths, lapped six (6) inches at ends. Cap flashing shall be increased longitudinally to produce spring action to hold bottom edge of cap flashing firmly against base flashing. Cap flashing shall lap base flashing at least four (4) inches, with exposed bottom edge at a forty-five (45) degree angle downward and folded back on underside at least 1/2" to form drip. Make cap flashing continuous at corners and angles.

I. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein but indicated on drawings and/or required to provide a watertight installation.

J. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.

K. Reglets

1. Provide watertight reglets in masonry and concrete work to receive cap flashing. Form reglets of stainless steel using same thickness as stainless steel sheet metal specified.

2. In masonry work use open or closed slot reglets with slat at least one (1) inch deep and 3/16" wide. Provide hook dams or turn-ups for anchoring securely into mortar joints. Insert cap flashing into slot full depth using button punch or lead wedges to lock in place.

3. In concrete work, use open or closed slot reglets with slot sloped upward at forty-five (45) degrees, at least one (1) inch deep and 3/16" wide. For fastening reglets to concrete forms use double-head stainless steel nails spaced twelve (12) inches apart maximum.

4. Insert cap flashing full depth into reglet slot, and wedge in place using lead strips spaced on twelve (12) inch centers maximum or lead caulking rope. When lead strips are used for continuous caulked reglets, use approved weather-resistant fibrous compounds.

END OF SECTION 076200

SECTION 07 71 23

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum downspouts and accessories.

1.2 RELATED SECTIONS

A. 074113 Metal Roof Panels .

1.3 REFERENCES

A. ASTM ;B32 - Solder Metal.

B. ASTM :B209 - Aluminum and Aluminum Alloy Sheet and Plate.

C. SMACNA - Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

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, 6 inches long, illustrating component design, finish, color and configuration.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code(s) for size and method of rain water discharge.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

B. Stack preformed and prefinished material to prevent twisting, bending or abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

1.7 COORDINATION

A. Coordinate work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM 8209, 3003 alloy, H14 temper; 0.032 inch thickness or as indicated; mill finish interior, shop pre-coated Kynar 500 or Hylar 5000 finish, color to match standing seam metal roof panels.

2.2 COMPONENTS

A. Gutters: SMACNA style profile seamless, 6 inch box gutter.

B. Downspouts: SMACNA rectangular profile seamless 3 inch x 4 inch. Configure with soldered elbow offsets to provide minimal clearance to Canopy structure while providing allowance for concealed connectors.

C. Cast Iron Boots: 4" Ø Rectangular iron downspout to round discharge outlet with integral mounting strap, heavy duty painted gray with cleanout. 18" minimum casting. Barrycraft B25A or approved equal.

2.3 ACCESSORIES

A. Anchorage Devices: Concealed Type recommended by manufacturer.

B. Gutter Supports: Hidden flanges screwed to fascia and interlocked / fastened to the top front edge of gutter.

C. Downspout Supports: Flat 1 1/4" min. width concealed straps matching leader profile and color.

D. End Caps, Elbows: Fabricate to gutter profile with factory soldered connections.

E. Fasteners: Aluminum finish exposed fasteners same as leader metal.

F. Leaf Screen: 10 gauge welded screen, galvanized after fabrication, sized to fit and cover entire length of gutter with gaps.

G. Splash Blocks: Provide precast concrete (5000 psi) splash blocks where downspouts discharge onto grade.

H. Primer: Zinc chromate type.

I. Protective Backing Paint: Bituminous

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.

B. Fabricate with required connection, expansion and splice pieces.

C. Form sections square in required profile, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints and at intervals required by the manufacturer.

D. Hem exposed edges of metal.

E. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal all field joints and intersections with adjacent materials with color matching exterior vertical grade sealant.

F. Fabricate gutter and downspout accessories; seal watertight.

2.5 FINISHES

A. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

A. Install gutters, downspouts and accessories in accordance with manufacturer's instructions and approved shop drawings.

B. Slope gutters 1/8 inch per foot minimum to leader locations.

C. Seal metal joints other than factory welded joints watertight.

D. Provide leader strap connections at 5'-0" maximum with a minimum of at least two connections per section.

B. All gutter hangers shall be installed and fastened at 30 inches o.c. maximum.

END OF SECTION 077123

SECTION 07 72 00

ROOF 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. Roof curbs.
2. Pipe supports.
3. Preformed flashing sleeves.

B. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory indicated. include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. include plans, elevations, keyed details, and attachments to other work. indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof- mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.
5. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.

b. Chalking in excess of a No. B rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Aluminum Sheet: ASTM 8209, 0.040 inch thickness or as indicated, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.

3. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Stainless-Steel Sheet and Shapes: ASTM A24O/A240M or ASTM 4666, Type 304.

C. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturers for a complete installation.

B. Polyisocyanurate Board insulation: ASTM C1289, thickness as indicated.

C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M. D Underlayment:

1. Felt: ASTM D226, Type ll (No.30), asphalt. Saturated organic felt, non-perforated.
2. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D4397,
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

D. Fasteners: Roof accessory manufacturers recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM 4153/4153M or ASTM F 2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

F. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

G. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

1. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed

corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Greenheck Fan Corporation

b. Milcor lnc. ; Commercial Products Group of Hart & Cooley, lnc

c. Pate Company (The)

d. Thvbar Corporation

2. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: Coordinate and verify load requirements with approved manufacturer's Product Data for each piece of equipment requiring support.

D. Material: Aluminum sheet, 0.090 inch thick.

1. Finish: Factory prime coating Baked enamel or powder coat .

2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.

2. Fabricate equipment supports to minimum height of 12 inches unless otherwise indicated.

3. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

4. Security Grille: Provide where indicated.

2.4 PIPE SUPPORTS

A. Pipe Supports: Adjustable-height, extruded-aluminum tube, filled with urethane insulation; 2 inches in diameter; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated and extruded-aluminum carrier assemblies; suitable for quantity of pipe runs and sizes.

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:

2. Pipe Support Height: As indicated on Drawings.

3. Roller Assembly: With stainless-steel roller, sized for supported pipes.
4. Pipe Support Flashing: Manufacturer's standard insulated sleeve flashing with integral base flange; aluminum sheet, 0.063 inch (1.60 mm) thick.
5. Finish: Manufacturer’s standard.

2.5 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and slotted metal collar.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Custom Solution Roof and Metal Products
   b. Milcor lnc.; Commercial Products Group of Hart & Cooley, Inc
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Diameter: As indicated .
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   b. Custom Solution Roof and Metal Products
   c. Milcor lnc.' Commercial Products Group of Hart & Coolev lnc
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Height: 13 inches (330 mm).
4. Diameter: As indicated.
5. Finish: As selected by the Architect from the manufacturer's full line of finishes.

C. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

E. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: install roof accessories according to manufacturer's written instructions.

1. install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

2. Anchor roof accessories are securely in place so they are capable of resisting indicated loads.

3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.

4. lnstall roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.

3. Bed flanges in thick coat of roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb installation: install each roof curb so top surface is level.

D. Equipment Support installation: install equipment supports so top surfaces are level with each other.

E. Roof-Hatch I installation :

1. Install roof hatch so top surface of hatch curb is level.

2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

3. Attach safety railing system to roof-hatch curb.

4. Attach ladder-assist post according to manufacturer's written instructions.

F. Pipe Support installation: install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.

G. Preformed Flashing-Sleeve installation: Secure flashing sleeve to roof membrane according to flashing- sleeve manufacturer's written instructions.

H. Seal joints with butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Clean off excess sealants.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 07 72 53

SNOW GUARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Standing Seam Two-Pipe Snow Guard.

1.2 RELATED SECTIONS

A. 074113 Metal Roof Panels .

1.3 ACTION SUBMITTALS

A. Product Data: include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: include roof plans showing layouts and attachment details of snow guards.

1. include details of Two-Pipe Snow Guard.

2. include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

C. Samples: Base, bracket, and Pad type snow guard.

1.4 QUALITY ASSURANCE

A. Installer to be an approved installer of the specified roofing and snow guard materials with a minimum of five years of experience.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of snow guard, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inspect material upon delivery and order replacements for any missing, defective or damaged items.

B. Keep materials dry, covered and off the ground prior to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance:

1. Snow Loads: 30 pounds per square foot unless indicated otherwise on the drawings.

2.2 TWO-PIPE-TYPE SNOW GUARDS

A. Basis-of-Design Product Subject to compliance with requirements, provide product product by one of the following:

1. Alpine Snowguards, a Division of Vermont Slate & Copper Services, lnc., 888-766-427 3. www.alpinesnowguards.com:

a. Model ASG4025 Gusseted Snow Guards with ASG4025-AL

2. S-5! (888) 825-3432 www.s-5.com

a. ‘DualGuard’

B. Finish:

1. Powder Coated.

2. Color: Custom color from RAL color chart for best match to metal panel roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

C. Inspect structure and verify that it will withstand additional; snow loading that may occur due to snow guard installations. Notify the contractor of any deficiencies for correction prior to the installation of the snow guards. inform the Architect or Engineer of any such findings and remedial work required.

D. Verify that the roofing material has been correctly installed and inspected by the roofing manufacturer issuing the roofing warranty prior to and following the snow guard installations. installation of snow guards shall be in accordance with the roofing manufacturer's warranty.

3.3 INSTALLATION

A. Install snow guards according to manufacturer's written instructions. Space rows as recommended by the manufacturer.

B. Attachment to ribs of double-fold standing seam metal roof panels with suitable clamp system from selected manufacturer.

END OF SECTION 0077253

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smokeseals as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

5. Penetrations at each floor level in shafts and/or stairwells.

6. Construction joints, including those between top of fire rated walls and underside of floors above.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 033000.

B. Unit Masonry - Section 042000.

C. Joint Sealants - Section 079200.

D. Gypsum Drywall - Section 092900.

E. Piping penetrations - Division 22.

F. Duct penetrations - Division 23.

G. Cable and conduit penetrations - Division 26.

1.4 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 136 "Standard Test Method for Assessing Combustibility of Materials."

D. UL 263, UBC 7-1 "Fire Tests of Building Construction and Materials"

E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."

F. ASTM E 1399 "Test For Dynamic Movement Conditions."

G. ASTM E 1966 (Same as E. above).

H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."

I. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."

J. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."

K. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory, Volume II of current year.

2. Warnock Hersey Certification Listings, current year.

3. Omega Point Laboratories, current year.

L. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

1.5 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smokeseal assembly required for the Project.

C. Material Safety Data Sheets: Submit MSDS for each firestop product.

D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.

E. Engineering Judgment: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.6 QUALITY ASSURANCE

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

D. Firestopping products shall be asbestos free and free of any PCBs.

E. Do not use any product containing solvents or that requires hazardous waste disposal.

F. Do not use firestop products which after curing, dissolve in water.

G. Do not use firestop products that contain ceramic fibers.

H. Firestopping Installer Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop installer shall have a minimum of three years' experience (under present company name) installing firestop systems of the type herein specified.

I. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

J. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

K. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.

L. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.

M. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

1.8 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work.

B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.

F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

G. Coordinate this work as required with work of other trades.

1.9 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.

C. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

D. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers or approved equal:

1. Hilti, Inc.

2. Specified Technologies Inc.

3. 3M.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

a. Semi-refractory fiber (mineral wool) insulation.
b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Joint fillers for joint sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

E. Polypropylene Sleeves (PP): (For cast-in device options.)

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.

E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

H. Moldable putty pads by 3M or approved equal.

I. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

J. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.

K. Fire Rated Cable Management Devices: Factory-assembled round metallic sleeve device for use with cable penetrations, containing an integrated smoke seal fabric membrane that can be opened and closed for re-penetration.

L. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.

M. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

N. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

O. Blocks/Plugs: Intumescent flexible block/plug suitable for reuse in re-penetration of openings. Blocks shall allow up to 12” of unreinforced annular space.

P. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf safing insulation; Thermafiber Safing Mineral Wool Insulation by Thermafiber, Inc. (an Owens Corning company), Roxul Safe Fire Safing Insulation by Rockwool, Mineral Wool Safing by Johns Manville or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.

B. Material shall be classified non-combustible when tested per ASTM E 136.

2.6 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.

a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray.
b. Refer to Article 3.6 herein for description of fire safing insulation.

2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.

B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.

2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.

3. Firestop system used shall allow for deflection of floor above.

C. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION 078413

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Exterior wall joints not specified to be sealed in other Sections of work.
2. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.
3. Control and expansion joints in walls.
4. Joints at wall penetrations.
5. Joints between items of equipment and other construction.
6. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

A. Roofing - Division 7.

B. Concrete Panels - Section 074246.

C. Firestop sealants - Section 078413.

D. Glazing sealants - Section 088000.

E. Sealant within drywall construction - Section 092900.

F. Sealant at tile work - Section 093013.

G. Sealant at paving - Division 32.

1.4 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled, and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C 794 and C 1521 that is appropriate for the types of Project joints.

C. Perform testing per ASTM C 1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted and the Architect has given written approval to proceed with the work.

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:

1. Color samples of sealants, submit physical samples (not color chart).

2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

1. Sealant materials, indicating that material meets standards specified herein.

2. Backing rods.

D. Submit manufacturer's certification as required by Article 1.6 herein.

E. Submit results of testing required in Article 1.4 herein.

1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.7 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.8 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Storage

1. Store sealant materials and equipment under conditions recommended by their manufacturer.

2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.

3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.9 WARRANTY

A. Provide a written, notarized warranty from the manufacturer stating that the applied sealants shall show no material failure for a period of twenty (20) years.

B. Contractor to provide a written, notarized warranty stating that the applied sealants shall show no failure due to improper installation for a period of five (5) years.

C. Warranty shall be in a form acceptable to the Owner and executed by an authorized individual.

D. Include in the warranty an agreement to repair and/or replace, at the Contractor's expense, sealant defects that develop during the warranty period as a result of faulty labor and/or materials.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to "DOWSIL 790" or "DOWSIL 795" made by The Dow Chemical Company, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco or

"Sonolastic 150" by Sonneborn conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

B. Interior Sealant: Provide a one (1) part acrylic-based sealant conforming to ASTM C 834, equal to "AC-20+ Silicone" made by Pecora, Masterseal NP 520 by BASF or equal made by Tremco.

C. Colors: Colors selected from manufacturer's standard selection.

2.2 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "HBR" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Sample Section of Sealant

1. During sealant installation work in exterior wall, the manufacturer of sealant shall send their representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining

performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.

2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.

3. Accepted control section shall be standard to which all other sealant work must conform.

C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

E. Preparation and Application

1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

   a. Do not use any acid or other material which might stain surfaces.
   b. Remove laitance by grinding or mechanical abrading.
   c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.

3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.

7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.

9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.

10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

11. Replace sealant which is damaged during construction process.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 5,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.
b. Whether sealant dimensions and configurations comply with specified requirements.
c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION 079200

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 080671 – DOOR HARDWARE SCHEDULE

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 references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service

representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 71 00 – Door Hardware.
2. Section 25 13 00 – Access Control.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. MR - Markar
4. RO - Rockwood
5. SU - Securitron
6. RU - Corbin Russwin
7. MC - Medeco
8. HS - HES
9. RF - Rixson
10. NO - Norton
11. SA - SARGENT
12. OT - Other

Hardware Sets

Set: 1.0

Door: 100

2	Continuous Hinges	FM300 xxx EL-CEPTx32D Cut to Length`	630	MR	087100	⚡
1	Electrified Rim Exit	PED52905 A M91 M92 MELR M54 1259905PT CT7SB	630	RU	087100	⚡
1	Rim Exit Device, Exit Only	PED5201 A M91 M92 M54 EO	630	RU	087100	
2	Surface Closer	UNI9500 TBGN	689	NO	087100	
1	Automatic Opener	6071 / 6061 TBGN	689	NO	087100	⚡
2	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
2	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
2	Door Switch	671		NO	087100	⚡
~~1~~	~~Power Supply~~ *	~~AQL4-R8E1~~		~~SU~~	~~087100~~	~~⚡~~

SET 1.0 NOTES:
- Doors normally locked and closed.
- Valid credentials energize lever for manual entry and energizes actuator for auto operation.
- Entry by manual key alerts head end as to entry w/ out audit trail.
- Egress by either push pad shunts DPS for authorized exit either leaf, or by actuator at all times.
- Bolt monitor alerts security when door held open too long.
- Free egress permitted at all times.
- System is Fail Secure.

Remote release, if provided, energizes lever and actuator for authorized entry.

Set: 2.0

Door: 101

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Passage Latch	ML2010 125X M30 M92	626	RU	087100	⚡
1	Rim Exit Device, Exit Only	PED5201 A D EO CT7SB	630	RU	087100	

1	Electric Strike	1600-CLB-LMS	630	HS	087100	⚡
1	Electric Strike	9500-LBM	630	HS	087100	⚡
1	Automatic Opener	6011	689	NO	087100	⚡
1	Automatic Opener	6071 / 6061	689	NO	087100	⚡
1	Wall Stop	401 / 441cu	US26D	RO	087100	
2	Gasketing	S88		PE	087100	
2	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
2	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
2	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
2	Door Switch	671		NO	087100	⚡
~~1~~	~~Power Supply~~ *	~~AQL4-R8E1~~		~~SU~~	~~087100~~	~~⚡~~

SET 2.0 NOTES:

Entry to Corridor 103:

- Door normally closed and secured via delayed egress exit device.
- Presenting valid credential energizes actuator for auto operation by releasing electric strike, authorized manual entry and shunts DPS for set period of time.
- Depressing exit device for up to 3 sec initiates irreversible alarm and begin delayed egress entry up to 15 sec later (30 w/ AHJ prior approval). Once unlocked manual entry only permitted w/ audible alarm sounding.
- No trim on corridor 103 side.
- Upon fire alarm activation delayed egress is shunted and Electric strike Fails secure allowing fire rating and free egress on push side.
- System is Fail Secure.

Exit / Entry to Corridor 101:

- Door normally closed and unlocked from corridor 103 side only.
- Actuator always active and initiates auto operation by releasing electric strike and shunts DPS.
- Manual exit permitted and REX shunts elect strike LMS option permitting manual authorized exit.
- System is Fail Secure

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 3.0

Door: 101B

6	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Storeroom Lock	ML2057 125X M92 CT7SB	626	RU	087100	⚡
1	Passage Latch	ML2010 125X M30 M92	626	RU	087100	⚡
1	Small Format Inter Core	33700006N	26	MC	087100	
1	Electric Strike	1600	630	HS	087100	⚡
1	Surface Closer	PR9500 / R9500	689	NO	087100	
1	Automatic Opener	6071 / 6061	689	NO	087100	⚡
1	Wall Stop	401 / 441cu	US26D	RO	087100	
2	Gasketing	S88		PE	087100	
2	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
2	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
2	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
2	Door Switch	671		NO	087100	⚡
~~1~~	~~Power Supply~~ *	~~AQL4-R8E1~~		~~SU~~	~~087100~~	~~⚡~~

SET 3.0 NOTES: Inactive leaf is provided w/ exit only lockset w/ REX.
- Doors normally closed and locked.
- Valid credentials unlock electric strike and energizes actuator for manual or auto operation.
- Egress by either door shunts DPS by depressing inside lever
- Egress actuator always active for auto operation exit.
- Entry by manual key alerts security as to entry without audit trail.
- System is Fail Secure.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 4.0

Doors: 130

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Storeroom Lock	ML2057 125X M92 CT7SB	626	RU	087100	⚡

1	Small Format Inter Core	33700006N	26	MC	087100	
1	Electric Strike	1600	630	HS	087100	⚡
1	Automatic Opener	6071 / 6061	689	NO	087100	⚡
1	Wall Stop	401 / 441cu	US26D	RO	087100	
1	Gasketing	S88		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
1	Door Switch	671		NO	087100	⚡
1	Power Supply	AQL4-R8E1		SU	087100	⚡

SET 4.0 NOTES:
- Doors normally closed and locked.
- Valid credentials unlock electric strike and energizes actuator for manual or auto operation.
- Depressing inside lever shunts DPS for authorized egress
- Egress actuator always active for auto operation exit.
- System is Fail Secure

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 5.0

Doors: 104, 105, 106, 107, 110, 120, 122, 123, 125, 126A, 127, 128, 129, 142A, 150A, 151, 158

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Fail Secure Lock	ML20906-SEC 125X M92 CT7SB	626	RU	087100	⚡
1	Small Format Inter Core	33700006N	26	MC	087100	
1	Surface Closer	PR9500 / R9500	689	NO	087100	
1	Wall Stop	401 / 441cu	US26D	RO	087100	
1	Gasketing	S88		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡

~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	

SET 5.0 NOTES:
- Door normally closed and locked
- Unlocking of door by mechanical key alerts head end system of entry w/ out audit trail.
- Presenting proper credential unlocks outside lever and shunts DPS for authorized entry.
- RX tied to inside lever shunts DPS for set period of time.
- DPS alerts if door is held open longer than programmed time.
- Lock is Fail Secure.
- Free egress at all times.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 5.1

Doors: 140A, 140B, 143A, 144, 145A,145B, 155, 157

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	
1	Fail Secure Lock	ML20906-SEC 125X M92 CT7SB	626	RU	087100	
1	Small Format Inter Core	33700006N	26	MC	087100	
1	Surface Closer	PR9500 / R9500	689	NO	087100	
1	Wall Stop	401 / 441cu	US26D	RO	087100	
1	Gasketing	S88		PE	087100	
1	Automatic Drop Seal	411_PKL		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	
1	ElectroLynx Harness	QC-C2500P		MK	087100	
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Position Switch	DPS-x-x		SU	087100	
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	

SET 5.0 NOTES:
- Door normally closed and locked
- Unlocking of door by mechanical key alerts head end system of entry w/ out audit trail.
- Presenting proper credential unlocks outside lever and shunts DPS for authorized entry.
- RX tied to inside lever shunts DPS for set period of time.
- DPS alerts if door is held open longer than programmed time.
- Lock is Fail Secure.
- Free egress at all times.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 6.0

Doors: 153

6	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
2	Flush Bolt	555	US26D	RO	087100	
1	Dust Proof Strike	570	US26D	RO	087100	
1	Fail Secure Lock	ML20906-SEC 125X M92 CT7SB	626	RU	087100	⚡
1	Small Format Inter Core	33700006N	26	MC	087100	
1	Surface Closer	PR9500 / R9500	689	NO	087100	
2	Wall Stop	401 / 441cu	US26D	RO	087100	
2	Gasketing	S88		PE	087100	
2	Astragal	S772W 8'		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	⚡

SET 6.0 NOTES:
• Door normally closed and locked
• Unlocking of door by mechanical key alerts head end system of entry without audit trail.
• Presenting proper credential unlocks outside lever and shunts DPS for authorized entry.
• RX tied to inside lever shunts DPS for set period of time.
• DPS alerts if door is held open longer than programmed time.
• Lock is Fail Secure.
• Free egress at all times.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 6.1

Doors: 152, 154, 156

6	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
2	Flush Bolt	555	US26D	RO	087100	
1	Dust Proof Strike	570	US26D	RO	087100	
1	Fail Secure Lock	ML20906-SEC 125X M92	626	RU	087100	⚡

		CT7SB				
1	Small Format Inter Core	33700006N	26	MC	087100	
1	Surface Closer	PR9500 / R9500	689	NO	087100	
2	Wall Stop	401 / 441cu	US26D	RO	087100	
2	Gasketing	S88		PE	087100	
2	Astragal	S772W 8'		PE	087100	
1	Automatic Drop Seal	411_PKL		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
1	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	⚡

SET 6.0 NOTES:
• Door normally closed and locked
• Unlocking of door by mechanical key alerts head end system of entry without audit trail.
• Presenting proper credential unlocks outside lever and shunts DPS for authorized entry.
• RX tied to inside lever shunts DPS for set period of time.
• DPS alerts if door is held open longer than programmed time.
• Lock is Fail Secure.
• Free egress at all times.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 7.0

Doors: 102

3	Hinge, Full Mortise	TA2714 (Qty as req'd for height)	US26D	MK	087100	
1	Passage Latch	ML2010 125X	626	RU	087100	
1	Surface Closer	PR9500 / R9500	689	NO	087100	
1	Wall Stop	401 / 441cu	US26D	RO	087100	
1	Door Stop	458	CRM	RO	087100	
1	Electromagnetic Holder	998M	689	RF	087100	⚡
1	Gasketing	S88		PE	087100	

Set: 8.0

Door: 114, 116

6	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100
2	Flush Bolt	555	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Classroom Lock	ML2055 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
2	Surf Overhead Stop	10-x36	630	RF	087100
1	Gasketing	S88		PE	087100

Set: 9.0

Door: 121

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100
1	Dormitory Lock	ML2065 125X V21 CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100
1	Gasketing	S88		PE	087100

Set: 9.5

Doors: 111, 112

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (Qty as req'd for ht.)	US26D	MK	087100
1	Dormitory Lock	ML2065 125X V21 CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100
1	Gasketing	S88		PE	087100

Set: 10.0

Door: 113

3	Hinge, Full Mortise	TA2714 (Qty as req'd for height)	US26D	MK	087100
1	Passage Latch	ML2010 125X	626	RU	087100
1	Surface Closer	PR9500 / R9500	689	NO	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100
1	Door Stop	458	CRM	RO	087100
1	Gasketing	S88		PE	087100

Set: 11.0

Doors: 115A, 115C, 119A, 119C

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (Qty as req'd for height)	US26D	MK	087100
1	Push Pull	111x73C/73CL	US32D-MS	RO	087100
1	Surface Closer	PR9500 / R9500	689	NO	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100
1	Gasketing	S88		PE	087100

6.65

Set: 12.0

Door: 117

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (Qty as req'd for ht.)	US26D	MK	087100
1	Classroom Lock	ML2055 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Surf Overhead Stop	10-x36	630	RF	087100
1	Gasketing	S88		PE	087100

Set: 13.0

Door: 150B

3	Hinge, Full Mortise	TA2714 (Qty as req'd for height)	US26D	MK	087100
1	Storeroom Lock	ML2057 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Surface Closer	PR9500 / R9500	689	NO	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100

Set: 14.0

Door: 108

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100
1	Classroom Lock	ML2055 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Surf Overhead Stop	10-x36	630	RF	087100

Set: 15.0

Doors: 131, 141

1	Sliding Door Hdwe	HBP200A 6'		PE	087100
1	Fascia	F134C 72"		PE	087100
2	Flush Pull	872	US26D	RO	087100

Set: 16.0

Doors: 132, 142B, 143B

3	Hinge, Full Mortise	TA2714 (Qty as req'd for ht.)	US26D	MK	087100
1	Classroom Lock	ML2055 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Surface Closer	PR9500 / R9500	689	NO	087100
1	Wall Stop	401 / 441cu	US26D	RO	087100
1	Gasketing	S88		PE	087100

Set: 17.0

Doors: 118

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (Qty as req'd for ht.)	US26D	MK	087100
1	Classroom Lock	ML2055 125X CT7SB	626	RU	087100
1	Small Format Inter Core	33700006N	26	MC	087100
1	Surface Closer	CLP9500	689	NO	087100
1	Gasketing	S88		PE	087100

Set: 18.0

Door: A

2	Continuous Hinge	FM300WT10 7'0 EL-CEPTx32D	630	MR	087100	⚡
1	Electrified Rim Exit	PED52905 M92 M54 1258905PT M51 CT7SB	630	RU	087100	⚡
1	Rim Exit Device, Exit Only	PED5201 M92 M54 EO M51	630	RU	087100	
1	Surface Closer	CLP9500	689	NO	087100	
1	Automatic Opener	6071 / 6061	689	NO	087100	⚡
2	Gasketing	2891AS x 290AS TKSP		PE	087100	
2	Sweep	3452CNB TKSP		PE	087100	
2	Threshold	25_x_AFG FHSL14SS-2		PE	087100	
2	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
2	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
2	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
2	Door Switch	671		NO	087100	⚡
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	~~⚡~~

SET 18.0 NOTES:
• Doors normally closed and secured.
• Presenting valid credential unlocks lever on one leaf and energize actuator for auto operation.
• Exiting auto operator door by inside actuator at all times.
• Exiting either door manually shunts DPS via REX in push rail.
• System is Fail Secure.

This set represents the intended function of the opening. Actual products may vary as required by the selected manufacturer and the products that were used w/ the tested assembly. Alum x Ballistic Rated

Supplier NOTE- Door is 2 3/4" thick.

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 19.0

Door: E

2	Continuous Hinge	FM300 xxx EL-CEPTx32D Cut to Length	630	MR	087100	⚡
1	Electrified Rim Exit	PED52905 M92 M54 1258905PT M51 CT7SB	630	RU	087100	⚡
1	Rim Exit Device, Exit Only	PED5201 M92 M54 EO M51	630	RU	087100	
2	Surface Closer	CLP9500	689	NO	087100	
2	Gasketing	2891AS x 290AS TKSP		PE	087100	
2	Sweep	3452CNB TKSP		PE	087100	
2	Threshold	25_x_AFG FHSL14SS-2		PE	087100	
2	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
2	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
2	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	~~⚡~~

SET 19.0 NOTES:
Doors normally closed and secured.
Presenting valid credential unlocks lever on one leaf.
Exiting either door manually shunts DPS
System is Fail Secure

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 20.0

Doors: B

1	Continuous Hinge	FM300 xxx EL-CEPTx32D Cut to Length	630	MR	087100	⚡
1	Electrified Rim Exit	PED52905 M92 M54 1258905PT M51 CT7SB	630	RU	087100	⚡
1	Surface Closer	CLP9500	689	NO	087100	
1	Gasketing	2891AS x 290AS TKSP		PE	087100	
1	Sweep	3452CNB TKSP		PE	087100	
1	Threshold	25_x_AFG FHSL14SS-2		PE	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
~~1~~	~~Power Supply~~	~~AQL4-R8E1~~		~~SU~~	~~087100~~	⚡

SET 20.0 NOTES:
• Doors normally closed and secured.
• Presenting valid credential unlocks lever
• Exiting door manually shunts DPS
• System is Fail Secure

* Power Supply is not required – unless otherwise confirmed by Security vendor.

Set: 21.0

Doors: C, D

1	Continuous Hinge	CFMxxSLI-1100 Cut to ___"	630	MR	087100
1	Rim Exit	PED5201 M92 M54 EO M51 M61	630	RU	087100
1	Surface Closer	CLP9500	689	NO	087100
1	Gasketing	2891AS x 290AS TKSP		PE	087100
1	Sweep	3452CNB TKSP		PE	087100
1	Threshold	25_x_AFG FHSL14SS-2		PE	087100
1	Position Switch	DPS-x-x		SU	087100

SET 20.0 NOTES:
• Doors normally closed and secured.
• Exiting door manually will not shunt DPS so that building monitoring system will be alerted

Set: 22.0

Doors: 151G

1	Small Format Inter Core	33700006N	26	MC	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Position Switch	DPS-x-x		SU	087100	⚡
2	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡

Notes: All hardware provided as part of assembly door.

Set: 23.0

Doors: 126B

1	Sliding Door Hdwe	PF28200		PE	087100
1	Edge Pull	880	US26D	RO	087100
2	Flush Pull	872	US26D	RO	087100

Set: 24.0

Doors: T

1	Continuous Hinge	FM300WT10 7'0 EL-CEPTx32D	630	MR	087100	⚡
1	Continuous Hinge	FM300WT10 7'0	630	MR	087100	
2	Surface Bolt	585-12	US26D	RO	087100	
1	Fail Secure Lock	BL66608xNAC-SEC 125Y CT7SB	630	RU	087100	⚡
1	Small Format Inter Core	33700006N	26	MC	087100	
2	Surface Closer	CPS7500	689	NO	087100	
1	ElectroLynx Door Harness	QC-Cxxx LAR		MK	087100	⚡
1	ElectroLynx Harness	QC-C2500P		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK		SA	087100	
2	Position Switch	DPS-x-x		SU	087100	⚡
1	Card / FOB Reader	Card / FOB Reader by Div 28.		OT	281300	⚡
1	Power Supply	AQL4-R8E1		SU	087100	⚡

END OF SECTION 080671

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the steel door and frame work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Interior and exterior hollow metal doors and frames for fire-rated and unrated door openings.
2. Interior hollow metal vision panels.
3. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling, and tapping, as necessary.
4. Preparation of hollow metal doors to receive glazing where required.
5. Furnishing anchors for building into concrete and drywall.
6. Factory prime painting of work of this Section.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000, for installation of doors and frames.

B. Flush Wood Doors - Section 081416.

C. Finish Hardware - Section 087100.

D. Glass and Glazing - Section 088000.

E. Gypsum Drywall - Section 092900.

F. Painting and Finishing - Section 099000.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.

D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by prevailing Building Code in 30 minutes of fire exposure.

4. Fire rated assemblies must have UL approved label.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency

acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames under cover at building site. Conform to the requirements of ANSI A 250-11-2001 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Provide products manufactured by Ceco Door Products, or comparable product by Steelcraft, Curries, or approved equal meeting these specifications.

B. Exterior Doors and Frames

1. Basis of Design (Doors): Ceco Door/ Assa Abloy; energy efficient doors, or approved equal.

2. Basis of Design (Frames): Ceco Door/ Assa Abloy; Mercury Thermal Break Frames, TQB and TRB, or approved equal.

2.3 FRAMES

A. Materials

1. Frames for exterior openings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008, Type B not less than 14 ga., and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653 with A60 coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.

2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knock-down frames are not permitted.

2. Thermal-Break Frames: Frames shall be subject to the same compliance standards and requirements as standard hollow metal frames. Frames shall be tested for thermal performance in accordance with NFRC 102 and resistance to air infiltration in accordance with NFRC 400. Where indicated, provide thermally broken frame profiles available for use in both concrete and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weather stripping.

3. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp, or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

4. Jamb depths, trim, profile, and backbends shall be as shown on drawings.

   a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.

5. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.

6. Minimum depth of stops shall be 5/8".

7. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

   a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.

8. Hardware Reinforcements

a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated, mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.
b. Minimum thickness of hardware reinforcing plates shall be as follows (Contractor shall provide larger and thicker plates as required to accommodate weight of door):
   1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
   2). Strike reinforcements - twelve (12) gauge.
   3). Flush bolt reinforcements - twelve (12) gauge.
   4). Closer reinforcements - twelve (12) gauge.
   5). Reinforcements for surface mounted hardware - twelve (12) gauge.

9. Floor Anchors

   a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
   b. Minimum thickness of floor anchors shall be fourteen (14) gauge.

10. Jamb Anchors

   a. Frames for installation in concrete walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
      1). Frames up to 7'-6" height - three (3) anchors.
      2). Frames 7'-6" to 8'-0" height - four (4) anchors.
      3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.
   b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
      1). Frames up to 7'-6" height - four (4) anchors.
      2). Frames 7'-6" to 8'-0" height - five (5) anchors.
      3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".

11. Anchors in exterior frames and in concrete walls shall be hot dip galvanized per ASTM A 153.

12. Frames for installation in concrete wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width. Stiffeners shall not be used as lintels or load bearing members.

13. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in concrete or plaster partitions.

14. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.

15. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

16. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

17. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.

C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

1. Frames set in concrete walls shall be grouted in as described in Section 042000, "Unit Masonry." These frames shall have surfaces in contact with grout shop coated with epoxy coating equal to Series 27 FC Typoxy made by Tnemec or approved equal spray applied at 4 to 6 mils, passing NFPA 101, Class A for smoke and flame spread, tested per ASTM E 84.

2.4 HOLLOW METAL DOORS

A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors shall be not less than sixteen (16) gauge and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653, A60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level.

1. Design: Flush panel.

2. Core Construction: Foamed-in-place polyurethane and steel-reinforced core with no stiffener face welds.

a. Provide 16 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed-in-place polyurethane core shall be chemically bonded to all interior surfaces. No face welding is permitted.
b. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.

c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.

C. Design and Construction

1. All doors shall be of the types and sizes shown on the approved shop drawings and shall be fully-welded, seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid, and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty-two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weatherstripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

6. Edge profiles shall be provided on both vertical edges of doors as follows:

   a. Single-Acting Swing Doors: Beveled 1/8" in two (2) inches.
   b. Double-Acting Swing Doors: Rounded on 2-1/8" radius.
   c. No square edge doors permitted.

7. Hardware Reinforcements

   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
   b. Minimum gauges for hardware reinforcing plates shall be as follows (Contractor shall provide larger and thicker plates as required to accommodate weight of door):
      1). Hinge and pivot reinforcement - seven (7) gauge.

2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
b. Fixed moldings shall be securely welded to the door on the security side.
c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

D. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

E. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.

B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.7 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".

2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".

3. Bottom: 3/8" at threshold; 3/4" if no threshold.

B. Fire-rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware, or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION 081113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 081416

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Solid core flush wood doors, including sliding doors.

2. Fire-rated flush wood doors.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000, for installation of wood doors.

B. Steel Doors and Frames - Section 081113, for hollow metal frames.

C. Finish Hardware - Section 087100.

D. Glass and Glazing - Section 088000.

1.4 SUBMITTALS

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

1. Include details of core and edge construction and trim for openings.

2. Include factory finish specifications.

3. Include certifications to show compliance with specifications.

4. Include certification to show compliance with AWI and WDMA requirements specified herein.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for finishing and other pertinent data.

1. Include requirements for veneer matching.

C. Submit samples of factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade and WDMA "Extra Heavy Duty" Performance Level.

1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.

2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.

C. Fire-Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.

1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.2 herein, or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect for the life of the installation starting from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SOLID CORE FLUSH WOOD DOORS

A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 1-3/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: Marshfield Door Systems, Inc., Algoma Hardwoods Inc., or Eggers Industries.

1. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.

2. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criterion, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.

a. Surface mounted hardware must be installed with minimum 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.

B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.

C. Stiles, Rails: Stile and rail shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed. Stiles and rails must be capable of screw holding of 550 lbs. per WDMA TM-10.

D. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System "Catalyzed Polyurethane Transparent."

1. Doors with transparent finish to have center balanced, slip matched, quarter sliced, Select veneer of wood species selected by the Architect. Veneer to conform to AWI, "AA" grade veneer with 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.

2. Veneers shall be continuous or end matched at transoms.

E. Opaque Finish: For doors to be shop painted, shop prime on all surfaces with one coat of alkyd wood primer applied to a dry film thickness of 1.5 mils. Apply final topcoat in the shop to paint manufacturer's specified thickness.

1. Doors to be field painted shall have MDO or hardboard face.

F. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of same type of wood as face veneer. Lite openings in 20 minute rated doors shall have manufacturer's 20-minute approved hardwood system.

G. Doors shall have hinge-loading capacity of 500 lbs. per WDMA TM-8.

H. Vertical door edge must be capable of screw holding of 550 lbs. per WDMA TM-10; horizontal door edge must be capable of screw holding of 400 lbs. per WDMA TM-10.

I. Fire-Rated Wood Doors: Provide mineral core 1-3/4" thick solid core wood doors conforming to standards specified herein, manufactured by one of the manufacturers noted above. Stile construction on both stiles shall conform to the following:

1. Stile edge screw withdrawals when tested in accordance with ASTM D 1037-12 shall exceed 650 lbs. This applies to both stiles.

2. Stile edge split resistance when tested in accordance with ASTM D 143-14 Modified must exceed 950 lbs. This applies to both stiles.

3. Door to have face finish as specified above.

a. Where the core is free of urea formaldehyde, provide a layer of veneer over the substrate prior to application of finish veneer to prevent telegraphing of patterns from the adhesive.

4. Blocking: For surface mounted hardware only, provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:

a. 5-inch top rail blocking.
b. 5-inch bottom rail blocking.
c. 1 – 5" x 18" lock block at cylinder or mortise locksets.
d. 2 – 5" x 18" lock blocks at exit devices.

5. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.2 FABRICATION

A. Prefit and premachine wood doors at the factory.

B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.

E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.

1. Three-degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.

2. Comply with requirements in NFPA 80 for fire-rated doors.

F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Provide concealed intumescent seals at fire-rated pairs of doors meeting the requirements of U.L. 10 C.

G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

H. Once wood doors are installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16-inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Section 062000 for installation of wood doors.

END OF SECTION 081416

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Frameless recessed panel access doors at drywall ceilings and walls.

2. Framed flush panel access doors at masonry and tile walls.

3. Provide access doors and frames for access from occupied spaces to the following, where indicated or required, and as directed by the trades of Divisions 23 and 26.

   a. All shutoff or balancing valves.
   b. Fire dampers, as required.
   c. Points of duct access.
   d. Pull boxes.
   e. Controls of mechanical and electrical items.
   f. Masonry shafts for pipes and conduits, as required.
   g. Pipe spaces, if required.
   h. Inlets of fans.
   i. Fusible link and splitter damper at filter bank.
   j. Automatic damper and motor.
   k. Equipment not otherwise accessible.

1.3 RELATED SECTIONS

A. Unit Masonry - Section 042000.

B. Gypsum Drywall - Section 092900.

C. Ceramic Tiling - Section 093013.

D. Valves and connections - Division 23.

1.4 QUALITY ASSURANCE

A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge, and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.

2. Provide flush, key operated cylinder lock.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.5 SUBMITTALS

A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of all access doors for Architect's acceptance prior to installation.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Provide access door assembly manufactured by Karp Associates, Inc., Milcor Inc., Nystrom Inc., or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.

B. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.

C. Frames for Masonry and Tile Wall Only (Flush Panel Units): Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for exposed masonry and tile finishes.

1. For installation in masonry construction, provide frames with adjustable metal masonry anchors.

D. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.

E. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to

support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

F. Locking Devices

1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.

2. For fire rated doors, provide locks as described in paragraph 1.4, B. herein.

G. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

A. Coordinate all work with the mechanical trades to insure proper locations and in a timely manner to permit orderly progress of the total work.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION 083113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 083453

SECURITY DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the security doors and frames as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Exterior aluminum security doors and frames.

2. Preparation of doors and frames to receive finish hardware, including reinforcements, drilling, and tapping necessary.

3. Preparation of hollow metal doors to receive glazing where required.

1.3 RELATED SECTIONS

A. Installation of doors and frames - Section 062000.

B. Security Windows - Section 085653.

C. Finish Hardware - Section 087100.

D. Glass and Glazing - Section 088000.

E. Gypsum Drywall - Section 092900.

F. Painting and Finishing - Section 099000.

1.4 REFERENCES

A. American Welding Society (AWS) (www.aws.org) D1.3/D1.3M - Structural Welding Code - Sheet Steel.

B. Underwriters Laboratories (UL) (www.ul.com) 752 - Bullet Resisting Equipment.

C. American Architectural Manufacturers Association (AAMA):

1. AAMA/WDMA/CSA 101/I.S.2/A440–Standard Specifications for Windows, Doors, and Skylights

2. AAMA 1503 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

D. American National Standards Institute (ANSI)

1. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

E. ASTM International

1. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

3. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

4. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.

5. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.

6. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

F. Consumer Product Safety Commission (CPSC)

1. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

G. Glass Association of North America (GANA)

1. Glazing Manual (current edition).

1.5 SYSTEM DESCRIPTION

A. Design Requirements: Provide door and frame assemblies of “non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.

B. Test Procedures and Performance:

1. Specifications for Windows, Doors and Unit Skylights: AAMA 101.

2. Air Infiltration Test: ASTM E 283, at 6.24 psf static air pressure differential. Air infiltration shall not exceed 0.10 CFM per sq. ft.

3. Water Resistance Test: ASTM E 331, no water leakage at 15 psf static air pressure differential.

4. Uniform Load Deflection Test: ASTM E 330, at static air pressure of +/- 100 psf. No member shall deflect more than 1/175 of its span.

5. Uniform Load Structural Test: ASTM E 330, at static air pressure difference of +/- 150 psf.

6. Condensation Resistance Test: AAMA 1503.1, CRF shall be not less than 55.

7. Thermal Transmittance Test: AAMA 1503.1, U-Value shall not exceed 0.30 BTU/HR/SQ.FT/°F.

8. Door Lobby waiting Area: SHGC 0.4 to 0.6.

9. Wind Loads: 70psf, unless greater required by Code.

10. Impact Loads: 2000 ft lb.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Provide hardware templates to door and frame assembly manufacturer for preparation of door and frame units to receive hardware other than hinges.

1.7 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

D. Field Measurements: Take necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.

E. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

F. Verification Samples: Submit representative samples of each material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

G. Calculations: Provide professionally prepared calculations and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied; refer to Article 1.5, para. D for further description.

H. Test Reports: Provide certified test reports for specified tests.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

1. Door and Frame Assemblies: Ballistic Level 1,tested to UL 752.

C. Source Limitations: Obtain aluminum security doors and frames through one source from a single manufacturer.

D. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.

E. Design Criteria: Drawings indicate sizes, member spacings, profiles, and dimensional requirements of work of this Section. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Architect's sole judgment, such deviations do not materially detract from the design concept or intended performances.

F. Engineering: Provide services of a Professional Engineer, registered in State of New York, to design and certify that work of this Section meets or exceeds performance requirements specified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames upright under cover at building site. Conform to the requirements of ANSI/SDI A250.11 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

1.10 WARRANTY

A. Manufacturer’s one year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products by U.S. Bullet Proofing, Upper Marlboro MD 20774 Tel: 301-218-7920 Fax: 301-218-7925, www.usbp.com, email: info@usbp.com .

1. Basis of Design Product: Model USAD1000 15 R Forced Entry and ballistic resistant door system.

B. Action Bullet Resistant, Corp (actionbullet.com).

C. Insulgard Security Products, Phone 800.624.6315; website www.insulgard.com

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: System design to be performed by qualified professional engineer licensed in State of New York.

B. Structural Performance: Design and size components to withstand the following load requirements without damage or permanent set:

1. Design Wind Loads: As indicated on Drawings.

2. Movement: Ambient temperature range of 120 degrees F and a surface temperature range of 160 degrees F.

3. Uniform structural loading: No glass breakage or permanent damage to fasteners or system components, tested to ASTM E330/E330M at 1.5 times design pressure.

C. Ballistics Resistance: Installed bullet-resistant glazing shall withstand ballistic impact loads and forces without damage to the glazing beyond that allowed by referenced standards.

1. Ballistic Level: Pass UL 752 Level 4.

D. Storm Resistance: Pass FEMA 361-15 and ICC 500-14 testing.

2.3 SECURITY DOORS AND FRAMES

A. Type: Flush-glazed, thermally broken, extruded aluminum framed storm-resistant, forced-entry-resistant, ballistic-resistant doors and frames.

1. Product: Model USAD1000 15 R, (by US Bullet Proof) or equivalent Bullet Resistant Level IV Door (by Action Bullet Resistant Corp) or HP500 (by Insulgard Security Products).

2. Door: Designed to receive 1.47 inch glazing retained mechanically with gaskets on four sides.

a. Size (w x h): As scheduled.
b. Thickness: 2-3/4 inch.
c. Stiles: Wide 5-7/16 inch width.
d. Rails: 6-5/16 inch top rail; 10inch bottom rail.
e. Design: Two-lite with horizontal mullion.

B. Frame: 2-1/2 x 4-1/2 inch size, thermally broken at exterior door with transom, designed to receive 1.47 inch ballistics-resistant glazing retained mechanically with gaskets on four sides.

2.4 HARDWARE

A. Entrance Door Hardware: specified in Section 080671 Door Hardware Schedule.

2.5 SECURITY GLAZING

A. Thicknesses indicated are minimums. Provide ballistics-resistant glazing in thicknesses as necessary to comply with requirements indicated.

B. Ballistic-Resistant Glazing: Pass UL 752 Level 4.

1. Level 4 Form: All-Glass.

2.6 ACCESSORIES

A. Glazing Accessories: Specified in Section 08 80 00 – Glazing.

B. Anchors: Series 316 stainless steel.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

D. Exposed Flashing: Aluminum sheet finished to match framing members.

E. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240 of type recommended by manufacturer.

F. Concealed Framing Sealants: Manufacturer's standard.

G. Joint Sealants: For installation at perimeter of framing, as specified in Section 079200.

2.7 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B 221.

2. Sheet: ASTM B209.

2.8 FINISH

A. Superior - Performance Organic Finish: 2-coat or 3-coat depending on color chosen, PVDF fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: Match Kawneer’s “Dove Gray.”.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install doors, framing, and glazing in accordance with manufacturer's instructions and approved Shop Drawings, and refer to Section 062000 for installation procedures for all work of this Section.

B. Installation Tolerances: Comply with the following non-accumulating maximum tolerances:

1. Maximum Variation in Diagonal Framing Measurements: 1/8 inch.

2. Offset Between Adjacent Framing Members: 1/16 inch.

3. Maximum Variation from Plumb: 1/8 inch per 12 feet.

4. Alignment: Plus or minus 1/16 inch from door face to face of framing.

5. Door Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

6. Sealant space between system and adjacent construction: As indicated but not greater than 1/2 inch or less than 1/4 inch.

C. Design Clearances:

1. Between Door and Frame: Maximum 1/8 inch.

2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

END OF SECTION 083453

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 084113

INTERIOR ALUMINUM STOREFRONTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum entrances and storefronts as indicated on the drawings and/or specified herein, including the following:

1. Exterior entrance systems.
2. Interior entrance systems.
3. Exterior storefront systems.
4. Interior storefront systems.

1.3 RELATED SECTIONS

A. Joint Sealers - Section 079200.

B. Security Aluminum Entrances - Section 084213.13.

C. Security Storefronts - Section 084333.13.

D. Security Windows - Section 085653.

E. Glass and Glazing - Section 088000.

1.4 QUALITY ASSURANCE

A. Source: For each material type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.

C. Design Criteria: Drawings indicate sizes, member spacings, profiles, and dimensional requirements of work of this Section. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Architect's sole judgment, such deviations do not materially detract from the design concept or intended performances.

D. Engineering: Provide services of a Professional Engineer registered in the State of New York to design and certify that work of this Section meets or exceeds performance requirements specified.

1.5 TESTS AND PERFORMANCE REQUIREMENTS

A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements.

B. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show interfaces and relationships to work of other trades.

C. Field Measurements: Take necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.

D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

E. Verification Samples: Submit representative samples of each material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

F. Calculations: Provide professionally prepared calculations and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied; refer to Article 1.4, para. D for further description.

G. Test Reports: Provide certified test reports for specified tests.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.8 WARRANTIES

A. Provide written warranty, signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship. "Defects" is defined to include, but not be limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty Period: Three (3) years from date of Substantial Completion; except finish shall be warranted for a period of fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS

A. Provide storefronts and entrance systems of one of the following manufacturers that meet or exceed requirements of these specifications:

1. Kawneer North America.

2. Oldcastle Building Envelope.

3. Tubelite, Inc.

4. YKK AP America, Inc.

B. Products:

1. Interior frame system shall be equal to "Trifab II 450" manufactured by Kawneer, or approved equal by one of the manufacturers listed above.

2.2 MATERIALS AND ACCESSORIES

A. Aluminum Members: Provide 6063-T5 alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish. Comply with ASTM B 221 for extrusions, and ASTM B 209 for sheet/plate. Provide 0.125" thick extrusions for door stiles and storefront framing. Provide 0.050" thick aluminum for glazing moldings.

B. Fasteners: Provide non-magnetic stainless steel fasteners, warranted by manufacturer to be non-corrosive and compatible with aluminum components.

C. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum 0.062" minimum, of an alloy and type selected by manufacturer for compatibility with other components.

D. Brackets and Reinforcements: Non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 123.

F. Bituminous Coatings: Cold-applied asphalt mastic compounded for 30-mil thickness per coat.

2.3 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on Drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.

B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.

2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.

C. Welding: Comply with recommendations of American Welding Society to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator to prevent corrosion.

E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

F. Fasteners: Conceal fasteners.

G. Provisions shall be made in the framing for minimum edge clearance, nominal edge cover, and nominal pocket width for the thickness and type of glazing installed, and shall be in accordance with the FGMA Glazing Manual.

H. Pocket glazed framing shall provide:

		Insulating Glass
1.	Nominal edge cover (or bite) framing only	1/2"
2.	Min. nominal edge clearance	1/4"
3.	Min. face clearance	5/32"

2.4 STOREFRONT FRAMING

A. General: Provide inside-outside matched resilient flush glazed system with provisions for glass replacement. Shop fabricate and preassemble frame components where possible.

B. For glass and glazing, refer to Section 088000.

2.5 FINISH

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Custom color and gloss as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where aluminum entrances and storefronts are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install aluminum entrance doors and storefront framing in openings prepared under other Sections plumb, square, level, in exact alignment with surrounding work, with proper clearances, and securely and positively anchored to building structure, to meet performance requirements specified herein, in accordance with manufacturer's published instructions and approved submittals.

B. Use only skilled mechanics for erection, under supervision of manufacturer's representative.

C. Provide protection against galvanic action. Isolate dissimilar materials with bituminous coating or non-absorptive dielectric tape.

D. Install aluminum storefront frame.

E. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Section 079200.

F. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances.

1. Variation from Plane: Limit variation from plane or location shown to 1/8" in 12 feet; 1/4" over total length.

2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16". Where surfaces meet at corners, limit offset from true alignment to 1/32".

3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8".

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform testing indicated for storefronts.

B. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 PROTECTION AND CLEANING

A. Protect finished metal surfaces from damage during fabrication, shipping, storage, and erection, and from then until acceptance by Owner.

B. Clean metal surfaces promptly after installation, exercising care to avoid damage. Remove excess sealant, dirt, and other substances. Lubricate hardware and other moving parts.

C. Replace glass that is broken, cracked, or chipped prior to time of final acceptance of Project by Owner.

D. Clean glass surfaces promptly after installation, exercising care to avoid damage to same.

END OF SECTION 084113

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. Provide aluminum windows with fixed lites complete with required accessories, as shown on Drawings and as specified herein.

Caulking between window members and adjacent materials shall be performed by this Contractor in accordance with the requirements herein and in Specification Section 079200 Joint Sealers.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the transaction window as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Security window with bullet-resistant glazing.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900, for non-structural metal framing.

B. Joint Sealers - Section 079200.

1.4 QUALITY ASSURANCE

A. Take field measurements of existing openings prior to submitting shop drawings and show same on shop drawings for each opening. Note that the Contract Drawings show general locations and sizes of windows, but the Contractor shall remain responsible for all field measurements, quantities, etc.

B. Manufacturers shall have been engaged in the manufacture of security windows of resistance levels specified for not less than 10 years.

1.5 SUBMITTALS

A. Shop Drawings

1. Shop drawings shall show in detail and fully indicate locations and quantities of all the work, the kind, finish, size, section of each unit, overall and detail dimensions, factory and field joint locations, arrangements and details, location and detail of each piece of anchorage, and supporting construction provisions for the work of others.

2. Show all surrounding conditions on elevations and details, including steel, masonry, lintels, and anchorage; all correctly dimensioned.

3. Shop drawings of elevations shall be at scale of 3/4" = 1'-0" or larger. Other shop drawings shall be at scale that is normal to trade, or larger if required by Architect.

4. Contract drawings may not be used (reproduced, enlarged, reduced, etc.) for shop drawings.

5. Fully indicate all requirements regarding the manufacture, finishing, handling, storage, carting sequence and erection of the units.

6. Show joinery techniques, provision for horizontal and vertical expansion, glass and metal thicknesses, and framing member profiles.

7. Identify all materials, including metal alloys, glass types, fasteners, and glazing materials. Identify all shop and field sealants by product name and locate on drawings. Glazing details shall be at full size scale.

8. Show dimensioned position of glass edge relative to metal rabbet.

9. Verify all measurements of windows in the field before commencing fabrication.

10. Any proposed deviations from work shown on the Contract drawings shall be indicated and so identified on shop drawings for Architect's review.

B. Structural Calculations

1. Required mathematical calculations shall be prepared, signed and sealed by a Professional Engineer registered in New York State. Calculations required for:

   a. Design of mullions and other structural members in accordance with Par. 2.05F
   b. Window anchorage in accordance with Par. 3.06A

C. Samples

1. Color Chart: Chart shall include a minimum of 8 standard colors for color selection of finishes by the Project Architect.

2. For each color used on project, submit three (3) 12" long frame extrusion sections of window finished with Project Architect's color selection. Samples shall show full coverage of finish on extrusion and establish allowable color range. Use approved samples for comparison purposes during production finishing.

3. Sample of insulating glass unit for review for optical distortion.

   a. Sample shall be the larger of 36” x 48” or the largest size of glazed pane used on the project.
   b. Sample glazing shall be mounted in a frame which shall have wheels. Sample shall be delivered to the SCA and moved to the project location after approval.

4. Full size sample of largest size window or other project size window, as selected by the Project Architect, in project finish and color for approval before fabrication of windows for project installation. Sample shall be glazed with glazing material specified. If panning is specified, the sample shall have panning and exterior sill

attached. Sample shall be delivered to the project site. Approved window sample shall be incorporated into the project.

5. Sample window for installation within the masonry wall & air-vapor barrier mockup

    a. Frame type and configuration of such sample window shall be identical to the project window.

    b. Sample window shall be a minimum eight (8) SF.

    c. Finishes and glazing type for such sample window are not required to match the project windows.

    d. Window shall be delivered to the site.

    e. Sample shall be 12”x12”

D. Warranties:

1. Submit warranties as specified in form acceptable to the Owner:

2. Windows including all components, hardware and 4 bar hinges

3. Finishes on windows and component parts

4. Weatherstripping

5. Glazing

6. Sealants

7. Quality Assurance

    a. Manufacturers other than those certified herein shall submit letter of certification indicating a minimum of five (5) years successful experience manufacturing types and sizes of windows specified herein. Manufacturer’s certification shall include a list of projects where manufacturer’s product was installed and shall identify project name, location, date of installation and name, address and telephone number of Owners representative who can verify the information provided and furnish a reference.

    b. This requirement may be waived at the discretion of the Authority and subject to such additional requirements as the Owner may so require in order to permit such a waiver.

    c. Installer's list of projects completed indicating 5 years experience of successful installations of types and sizes of windows specified herein. List shall identify project name, location, date of installation and name, address and telephone number of Owners representative who can verify the information provided and furnish a reference.

    d. Provide letter from manufacturer approving the installer.

e. Manufacturer's certification for factory testing of windows.

f. Letter of certification by the window manufacturer that the windows proposed for use on the project are identical in every respect to the passing windows tested for the product certification laboratory test report, including all modifications made to the specimen to achieve a passing result. Manufacturer shall include Laboratory report test date and test number of the product's laboratory test in the letter.

8. VLT and SHGC values of glazing

9. Thermal Transmittance Test Report

10. Field Test Reports.

11. Shop Quality Control Program.

12. Acoustic test of window assembly

E. Project Closeout

1. Certification by manufacturer of the installation.

2. Manufacturers maintenance manual and instruction.

3. Extra Materials and as specified in Article 1.08.

4. The Contractor shall arrange for inspection of completed window installation by a representative of New York State Department of Labor and shall provide access for inspection by the New York State Department of Labor representative as may be required. Notify the Authority's representative of the date and time of the Department of Labor inspection 2 business days prior to the scheduled inspection.

5. Certification by the window manufacturer and contractor that the function check as specified in Article 3.08 has been satisfactorily completed.

F. Submittals for Product Certification or Project Specific Approval:

1. As a condition precedent to acceptance for the Work, for manufacturers and products that are not listed in Art. 2.01, the manufacturer shall submit the items listed in this paragraph in addition to the submittals specified in Art. 1.04, paragraph A.

2. Product Certification submittals are not required to be submitted for each project. Once a manufacturer and product has been certified, the submittals specified below will be kept on record at the Owner for the duration of the certification period after which time product certification must be renewed.

a. Product Certification Test reports. See Art. 1.05 and Part 4 for required tests and test report requirements.

b. Window manufacturer's specifications, installation recommendations. Catalog cuts and product literature for sealants, finish, glazing materials, thermal break material, hardware, 4 bar hinges & weatherstripping.

c. Die drawings cross-referenced to assembly drawings

d. Assembly drawings, standard details and glazing details.

e. Laboratory Test Reports from an AAMA accredited Laboratory for 4 bar hinges tested in accordance with AAMA 904.14.

f. Finish applicators Quality Control Program for monitoring compliance with the requirements of AAMA 2605. Include monitoring coating thickness(es); 100 double MEK rubs without pick up of paint finish; and testing for compliance with AAMA 2605 Articles 8.1 through 8.4 and 8.7 on samples of each part selected at random from each production run or shift.

g. Manufacturer’s Shop Quality Control Program, see Art. 1.05, Paragraph E.

h. Sealant and glazing manufacturer's detail review and tests for glazing materials, see Art. 2.05, Paragraph G.

i. Shop Drawings of Test Specimen

j. Manufacturer's Credentials:

1). Submit letter of certification indicating a minimum of five (5) years successful experience manufacturing types and sizes of windows specified herein.

2). Manufacturer’s certification shall include a list of projects where manufacturer’s product was installed and shall identify project name, location, date of installation and name, address and telephone numbers of Owners representative who can verify the information provided and furnish a reference.

3). These requirements may be waived at the discretion of the Owner and subject to such additional requirements as the Owner may so require in order to permit such a waiver.

3. Sample Window for review

a. Provide Sample for Architect review in size directed, but not larger than 3’-0” x 5’0”. Submit shop drawings for approval before fabrication. The window shall be mounted in a frame that shall have wheels.

4. Sample of each Warranty

G. Low Emitting Materials Compliance Submittals

1. Provide documentation for each sealant to be used on site and within the weatherproofing/waterproof membrane (interior) of the building, indicating that the sealants comply with V.O.C. requirements as stated in Specification Section G01600.

H. Sustainability Submittals

1. Submit documentation of recycled content consisting of product data or manufacturer’s statement as applicable for the following:

a. Window frames

Window glass

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Store and handle windows, mullions, panels, hardware and appurtenant items in strict compliance with manufacturer's instructions.

D. Protect units adequately against damage from elements, construction activities and other hazards, before, during and after installation.

E. Windows shall be individually shrink-wrapped and placed on properly sized pallets.

F. Windows shall be delivered with the NFRC or Thermal performance label affixed to each window.

1.7 WARRANTY

A. Manufacturer’s one year warranty against defects in materials and workmanship.

B. The starting of Warranty period is defined as the earlier of the following:

1. date of substantial completion

or

2. six months after the windows are delivered to the contractor

C. Submit written warranties to the Architect and to the Project Officer from window manufacturer and Contractor for the following in a form acceptable to the Owner:

1. Windows: Windows including all components, hardware shall be fully warranted against defects in material or workmanship under normal anticipated use and service for a period of 10 years starting from the onset of warranty period in a form satisfactory to the Owner. The first 3 years of the warranty shall include parts and

labor, the remaining 7 years of the warranty shall include parts only. (Window manufacturer)

2. Finish: The finishes on windows and component parts (such as panning, trim, mullions) shall be certified as complying fully with requirements of AAMA Specification 2605-11. Fluoropolymer finish shall be fully warranted against chipping, peeling, cracking, crazing, blistering, chalking and fading for a period of 10 years from the onset of warranty period. (Window manufacturer and finish applicator)

3. Weather-stripping: 10 years from the onset of warranty period. (Window manufacturer)

4. Glazing: 5 years from the onset of warranty period to furnish replacements for insulating glass units or laminated-glass units that deteriorate. Deterioration is defined as defects developed during normal use that are attributed to the manufacturing process and not to causes other than glass breakage from use, accident, or vandalism and practices for maintaining and cleaning glass contrary to manufacturer's written instructions. Defects include edge separation, cracking due to manufacturing/installation, delamination materially obstructing vision through glass, discoloration, peeling and cracking of Low E coating and blemishes exceeding those allowed by referenced laminated/insulated-glass standard. (Window manufacturer)

5. Sealants: Sealants shall be warranted against adhesive and cohesive failure by the Sealant manufacturer for 10 years from the onset of warranty period. Warranty shall cover labor and material.

1.8 EXTRA MATERIAL STOCK

A. Contractor shall provide extra pieces of glazing cut to size, and sash hardware.

B. Extra stock shall be new and identical to products specified and provided for the project.

C. At the completion of the Work, extra stock shall be turned over to the Owner for the use of the Custodian.

PART 2 PRODUCTS

2.1 ALUMINUM WINDOW

A. Furnish each security window assembly designed and built in a manner that provides a completely assembled, finished unit, installed in a finished opening.

B. Contract Documents are based on products by U.S. Bullet Proofing, Upper Marlboro MD 20774; Tel: 301-218-7920, Fax: 301-218-7925, www.usbp.com email: info@usbp.com

1. Basis of Design Product: Bullet-resistant fixed aluminum window USAW400.

a. Ballistics Performance: Installed bullet-resistant glazing shall withstand ballistic impact loads and forces without damage to the glazing beyond that allowed by referenced standards.
   1). 1-5/16" thick.
   2). Ballistic Level: Pass UL 752 Level 4.

PART 3 EXECUTION

2.1 ACCESSORIES

A. Glazing Accessories: Specified in Section 088000.

B. Anchors: Series 316 stainless steel.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

D. Exposed Flashing: Aluminum sheet per Div. 07 Section "FLASHING AND SHEET METAL"; finish to match framing members.

E. Normally retain 1st option below.

F. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240 of type recommended by manufacturer.

G. Framing Sealants: Manufacturer's standard.

H. Joint Sealants: For installation at perimeter of framing, as specified in Section 07 92 00.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B 221.

2. Sheet: ASTM B209.

B. Aluminum Extrusions

1. Alloy: 6063-T5, with not less than 22,000 psi ultimate tensile strength, a yield of 16,000 psi. Comply with ASTM B221. Thickness shall be as required to meet the performance requirements of AAMA/WDMA/CSA 101/I.S.2/A440-11 AW-PG40-AP and this specification section but not less than 0.080 inch for sash and frame (jamb, head & sill). Panning thickness shall be minimum 0.062 inch for jamb, sill and head sections.

C. Fasteners

1. Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.

2. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce interior with aluminum or non-magnetic stainless steel to receive screw or provide standard non-corrosive pressed-in spliced grommet nuts.

3. Do not use exposed fasteners on exterior for application of hardware. Match finish of adjoining metal.

4. Provide Type 300 series non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.

5. Locate fasteners not to disturb thermal break construction of windows.

D. Anchorage

1. Anchorage Clips

Provide manufacturer's standard extruded aluminum anchorage/interior trim clips spaced as required by approved structural calculations, but not exceeding 16" o.c.

2. If structural calculations determine that the extruded aluminum clips are not adequate, in addition to the aluminum clips provide bent clips, stainless steel. Shape, size, thickness and spacing of all anchorage clips as required by structural calculations.

3. Screws (clips to wood): Stainless steel, Type 300 series, hardened, Size as required by design.

4. Screws (clips to aluminum window): Stainless steel, Type 300 series, hardened, self-tapping blunt point sheet metal or self-drilling anchor. Size as required by design.

5. Expansion Shields and Bolts (clips to masonry): Type 300 series, stainless steel. Size as required by design.

6. Screws (Clips to steel members) Stainless steel, Type 300 or 400 series, non-corrosive, self-tapping blunt point screws. Size as required by design.

E. Compression glazing strips and weather-stripping: At manufacturer's option, provide extruded neoprene gaskets and butyl tape complying with ASTM D2000 Designation 2BC415 to 3BC415, PVC gaskets complying with ASTM D2287, or expanded neoprene gaskets complying with ASTM C509, Grade 4.

F. Sealant

1. Unless otherwise indicated, for sealants required within fabricated window units, provide elastomeric type as recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Provide sealants complying with AAMA Specification 803.3 that are compatible with and will adhere to surrounding materials.

2. All sealants used within the weatherproofing/waterproof membrane (interior) of the building shall be low V.O.C. in accordance with the requirements of Section G01600.

2.3 FABRICATION AND ACCESSORIE

A. General

Provide manufacturer's standard fabrication and accessories which comply with specifications and standards and which are reglazable without dismantling of sash framing, except where more specific or stringent requirements are indicated. Provide complete system for assembly of components and anchorage of window units and prepare complete preglazing at factory.

B. Window Members

All window members shall be of aluminum. Friction tabs, shoes, weather-stripping guides, and the secondary members shall be of aluminum or material compatible with aluminum.

1. Main frame and sash members shall have nominal thickness of 0.080", except for integral or applied fin trim. Master frame and vent shall be no less than 2.25" in depth. Frame and vent shall have a flush interior and exterior surface. Overlap or extensions of ventilators beyond main frame are not acceptable.

2. Stiles and rails of operating sash shall be tubular, with welded corners. Alternate methods of construction will be considered provided the window passes testing for the performance requirements specified herein. Provide weather-stripping both at exterior flange and at interior contact.

3. Glazing rabbet of sash shall be of sufficient dimensions to provide for expansion and contraction of insulating glass unit and edge engagement as recommended by the insulating glass unit manufacturer for the unit size, thickness, glazing system and the design wind load used for the project.

C. Thermal Break

Thermal barrier shall provide continuous uninterrupted thermal break around entire perimeter of frame and sash and shall not be bridged by any metal conductors at any point.

D. Hardware

Hardware having exposed component parts shall be of aluminum, stainless steel or other non-corrosive materials compatible with aluminum. Cadmium or zinc-plated steel where used shall be in compliance with ASTM Specification B766 or B633

E. Construction

1. Assembly: Windows shall be assembled in secure and workmanlike manner to perform as specified. Vents shall be mitered and sealed with non-hardening sealant, forming watertight joint. Corners of vents shall be structurally reinforced.

2. Corners of frame shall be coped construction with two screws per corner into screw ports and backsealed, forming watertight joint.

3. Alternate methods of construction will be considered provided the window passes testing for the performance requirements specified herein.

F. Mullions and other structural members:

When mullion units occur, whether joined by integral mullions, independent mullions or a combination of frame members, the resulting members shall be capable of withstanding load outlined under Uniform Load specified load requirements, without deflecting more than 1/175th of its span. Where independent or integral mullions are used to join windows, such mullions shall contain thermal break as specified. Evidence of compliance may be by mathematical calculations prepared, signed and sealed by a Professional Engineer licensed in the State of New York.

G. Glazing

1. Units shall be pre-glazed with insulating glass units at factory as specified herein.

2. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

   a. Glazing Performance: Provide glass with the following minimum performance requirements:
      1). Center of glass U Value: as required to meet window assembly thermal values
      2). Visible Light Transmittance: >40%
      3). Solar Heat Gain Coefficient: ≤0.36

3. Glass: Laminated glass complying with ASTM C1172. Consisting of two sheets of Type I, Class 1 clear annealed float glass 1/8" thick with 60 mil thick clear polyvinyl butyral (PVB) interlayer (unless indicated otherwise). PVB interlayer Saflex as manufactured by Solutia Inc., Butacite as manufactured by DuPont.

4. Preassembled Insulating Glass Units: 1" – 1¼" thick preassembled units consisting of sealed lites of glass separated by a dehydrated air or argon filled interspace, and complying with ASTM E2190. Manufacturer's standard edge construction of spacers and sealants permanently bonded to glass surfaces. Insulating glass units shall be certified by (IGCC) and shall be fabricated of the following glass.

   a. Exterior Glass: 1/8" annealed glass, 60 mil Polyvinyl Butyral (PVB) interlayer, 1/8" annealed glass with low-e coating on the interior surface.

      Or

      Minimum 3/16" thick tempered glass with low-e coating on interior surface.

   b. Interior Glass: with additional low-e coating if required to achieve 'U' value.

   c. 1/8" annealed glass, 60 mil PVB interlayer, 1/8" annealed glass

   d. Interior Glass where indicated: 1/8" annealed glass, 60 mil PVB translucent white interlayer, 1/8" annealed glass

e. Sealing System: Dual seal with manufacturer's primary and secondary sealants that are compatible with glazing materials and aluminum finish.

f. Corner construction: Manufacturer's standard corner construction.

g. Optical distortion: Insulating glass units shall not produce visible distortion of transmitted or reflected images as demonstrated using a striped pattern ("zebra board") or other method as determined by the Owner, in comparison to the 36" x 48" control sample at the School Construction Owner offices, 30-30 Thomson Ave., Long Island City, NY. Project sample shall be the larger of 36" x 48" or the largest size of glazed pane used on the project. Project sample shall be submitted for review and approval by the Architect prior to glazing window units. The approved sample shall be delivered to the project location and will serve as a standard of quality for all project windows.

h. Glass installed in project windows shall not exhibit visible distortion greater than the approved sample. If distortion is apparent in installed glass, then the entire window shall be removed and replaced. Field re-glazing of windows will not be permitted.

5. Inside bead glazed utilizing an extruded butyl tape with continuous integral shim at the exterior and a dense neoprene or EPDM wedge or hollow compression gasket at the interior secured in place with removable aluminum bead.

6. All glazing materials used with laminated glass shall be compatible with the PVB interlayer to prevent deterioration and delamination of same. Verify compatibility of glazing materials with manufacturer of the PVB interlayer.

7. Obscure PVB Interlayer

   Provide Translucent white PVB interlayer for inner lite of glazing system at Toilet and Locker Room Windows and other locations indicated on Drawings.

8. Submit glazing material manufacturer's certification of detail review and satisfactory test results for adhesion, compatibility and non-staining to all materials and finishes with which the glazing materials will contact.

2.4 INTERIOR TRIM

A. Interior trim, closures and angles shall be as detailed and of extruded or break formed aluminum shapes, min. 0.062" nominal wall thickness. There shall be no sharp edges on any exposed metal.

2.5 PROTECTION

A. Provide heavy coat of bituminous paint, or appropriate sealant, tape or other electrolytic isolator on portions of aluminum frames in contact with dissimilar materials unless coated with window finish paint system. All steel anchors and reinforcing shall be galvanized.

B. Provide heavy coating of Tnemec 115 Unibond or equivalent on surfaces of steel reinforcing and anchors to prevent direct contact with dissimilar materials except for finished aluminum. Leave no part of steel reinforcing exposed on exterior of building.

2.6 SILLS, STOOLS, APRONS

A. Provide aluminum sills, stools, aprons, and other trim and accessories, finished to match windows, as indicated on Drawings. Thicknesses, profiles and sizes as detailed.

2.7 FINISHES

A. Superior-Performance Organic Finish: 2-coat PVDF fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: Custom color as directed.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where bulletproof transaction windows are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. After delivery of windows to Site and before installation, the Owner reserves the right to select at random one window of each type and remove them to the office of the Owner for examination and inspection.

C. If, after the examination and inspection it is found that any window does not comply with requirements of Specifications, all windows of the type shall be inspected and defects corrected. If it is not possible to correct the defects at Site, the defective windows shall be removed from Site and all costs involved shall be borne by the Contractor.

D. If, after the examination and inspection it is found that the windows comply with requirements of Specifications, Contractor shall proceed with installation of windows including those examined and inspected by the Owner. The Owner will pay the cost to repair or replace windows damaged during the examination and inspection.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures, anchoring all components firmly into position for long life under hard use.

C. Use only skilled installers, with work done in accordance with approved shop drawings and specifications.

D. Install window units into prepared openings in strict accordance with approved shop drawings.

1. Set units plumb, level, and true to line, without warp or rack of frame.

2. Installation Tolerances: Comply with the following non-accumulating maximum tolerances:

   a. Maximum Variation in Diagonal Framing Measurements: 1/8 inch.
   b. Offset Between Adjacent Framing Members: 1/16 inch.
   c. Maximum Variation from Plumb: 1/8 inch per 12 feet.
   d. Alignment: Plus or minus 1/16 inch from door face to face of framing.
   e. Sealant space between system and adjacent construction: As indicated but not greater than 1/2 inch or less than 1/4 inch.

3.3 ADJUSTING AND CLEANING

A. After completion of installation, window units shall be inspected, adjusted, and left clean, free of labels, etc.

B. Glass that is broken, damaged, cracked, or permanently stained shall be replaced.

C. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protection coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and moving parts, as required for proper operation. Touch-up damaged paint finish employing finish formulators compatible air-dry fluoropolymer system.

D. Clean glazing as recommended by glazing material manufacturer, promptly after installation of windows. Remove glazing sealant compound, dirt and other substances. Temporary NFRC or Thermal performance stickers may be removed only after the completion of energy code special inspection.

E. Provide protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.

F. Deliver to the Owner's representative written recommendations and instructions for maintenance, repair, cleaning (including glazing) adjustment and protection of windows, after acceptance. Instruct the Custodian in methods of maintenance, adjustment, protection and reglazing.

END OF SECTION 085113

SECTION 085653

SECURITY WINDOWS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the transaction window as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Security window with bullet-resistant glazing.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900, for non-structural metal framing.

B. Joint Sealers - Section 079200.

1.4 QUALITY ASSURANCE

A. Take field measurements of existing openings prior to submitting shop drawings and show same on shop drawings for each opening. Note that the Contract Drawings show general locations and sizes of windows, but the Contractor shall remain responsible for all field measurements, quantities, etc.

B. Manufacturers shall have been engaged in the manufacture of security windows of resistance levels specified for not less than 10 years.

1.5 SUBMITTALS

A. Shop Drawings

1. Shop drawings shall show in detail and fully indicate locations and quantities of all the work, the kind, finish, size, section of each unit, overall and detail dimensions, factory and field joint locations, arrangements and details, location and detail of each piece of anchorage, and supporting construction provisions for the work of others.

2. Show all surrounding conditions on elevations and details, including steel, masonry, lintels, and anchorage; all correctly dimensioned.

3. Shop drawings of elevations shall be at scale of 3/4" = 1'-0" or larger. Other shop drawings shall be at scale that is normal to trade, or larger if required by Architect.

4. Contract drawings may not be used (reproduced, enlarged, reduced, etc.) for shop drawings.

5. Fully indicate all requirements regarding the manufacture, finishing, handling, storage, carting sequence and erection of the units.

6. Show joinery techniques, provision for horizontal and vertical expansion, glass and metal thicknesses, and framing member profiles.

7. Identify all materials, including metal alloys, glass types, fasteners, and glazing materials. Identify all shop and field sealants by product name and locate on drawings. Glazing details shall be at full size scale.

8. Show dimensioned position of glass edge relative to metal rabbet.

9. Verify all measurements of windows in the field before commencing fabrication.

10. Any proposed deviations from work shown on the Contract drawings shall be indicated and so identified on shop drawings for Architect's review.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 WARRANTY

A. Manufacturer’s one year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.1 SECURITY WINDOW

A. Furnish each security window assembly designed and built in a manner that provides a completely assembled, finished unit, installed in a finished opening.

B. Contract Documents are based on products by U.S. Bullet Proofing, Upper Marlboro MD 20774; Tel: 301-218-7920, Fax: 301-218-7925, www.usbp.com email: info@usbp.com

1. Basis of Design Product: Bullet-resistant fixed aluminum window USAW400.

a. Ballistics Performance: Installed bullet-resistant glazing shall withstand ballistic impact loads and forces without damage to the glazing beyond that allowed by referenced standards.
1). 1-5/16" thick.
2). Ballistic Level: Pass UL 752 Level 4.

PART 3 EXECUTION

2.1 ACCESSORIES

A. Glazing Accessories: Specified in Section 088000.

B. Anchors: Series 316 stainless steel.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

D. Exposed Flashing: Aluminum sheet per Div. 07 Section "FLASHING AND SHEET METAL"; finish to match framing members.

E. Normally retain 1st option below.

F. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240 of type recommended by manufacturer.

G. Framing Sealants: Manufacturer's standard.

H. Joint Sealants: For installation at perimeter of framing, as specified in Section 07 92 00.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B 221.

2. Sheet: ASTM B209.

2.3 FINISHES

A. Anodized Aluminum Finish: AAMA 611, Architectural Class I anodized, [clear.] [dark bronze.]

or

B. Superior-Performance Organic Finish: 2-coat PVDF fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: Custom color as directed.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where bulletproof transaction windows are to be installed and correct any conditions detrimental to the proper and timely completion of

the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures, anchoring all components firmly into position for long life under hard use.

C. Use only skilled installers, with work done in accordance with approved shop drawings and specifications.

D. Install window units into prepared openings in strict accordance with approved shop drawings.

1. Set units plumb, level, and true to line, without warp or rack of frame.

2. Installation Tolerances: Comply with the following non-accumulating maximum tolerances:

a. Maximum Variation in Diagonal Framing Measurements: 1/8 inch.
b. Offset Between Adjacent Framing Members: 1/16 inch.
c. Maximum Variation from Plumb: 1/8 inch per 12 feet.
d. Alignment: Plus or minus 1/16 inch from door face to face of framing.
e. Sealant space between system and adjacent construction: As indicated but not greater than 1/2 inch or less than 1/4 inch.

3.3 ADJUSTING AND CLEANING

A. After completion of installation, window units shall be inspected, adjusted, and left clean, free of labels, etc.

B. Glass that is broken, damaged, cracked, or permanently stained shall be replaced.

END OF SECTION 085653

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.

C. Related Sections:

1. Division 06 Section “Rough Carpentry”.
2. Division 08 Section “Door Schedule”.
3. Division 08 Section “Door Hardware Schedule”.
4. Division 08 Section “Hollow Metal Doors and Frames”.
5. Division 08 Section “Flush Wood Doors”.
6. Division 08 Section “Bullet Resistant Doors and Frame”.
7. Division 08 Section “Blast Resistant Doors”.
8. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
9. Division 08 Section “All-Glass Entrances”.
10. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.

8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.

Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

   a. Pemko (PE).

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Securitron (SU) - EL-CEPT Series.
1) For Continuous and Pin and Barrel hinges provide as integral part.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:

    a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: As directed by owner.

C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

a. Medeco (MC).

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.

2.8 MULTI-POINT LOCKS AND LATCHING DEVICES

A. Multi-Point Locksets, Blast and Hurricane: Provide ANSI/BHMA A156.37, Series 1000, Operational Grade 1 and Security Grade 1 Certified Products Directory (CPD) listed multi-point locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical locksets shall have the following functions and features:

a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable to fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
c. Optional deadbolt and latchbolt monitoring.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - BL6600 Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTROMAGNETIC LOCKING DEVICES

A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 2 with minimum holding force strength of 1,200 pounds. Locks to be capable of either 12 or 24 voltage and be UL listed for use on fire rated door assemblies. Electronics are to be fully sealed against tampering and allow exterior weatherproof applications. As indicated in Hardware Sets, provide specified mounting brackets and housings. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.

1. Manufacturers:

a. Securitron (SU) - M62 Series.

B. Delayed Egress Electromagnetic Devices: Delayed egress locking systems shall be fully integrated units with a minimum 1200 pound holding force magnetic lock, autosensing dual voltage with microprocessor technology, magnetic bond sensor and integrated door position

switch (DPS), and instant release circuit with no residual magnetism. System shall have easily visible LEDs that indicate status on secure side of door, adjustable door movement detection up to 1/4" and alarm strobe that indicates countdown and stays illuminated post alarm until reset.

1. Configurable settings shall include:

    a. Nuisance delay times: 0, 1, 2, or 3 seconds.
    b. Irrevocable alarm times: 15 or 30 seconds.
    c. Bypass delay times: 0, 15, 30, 45 seconds.
    d. No irrevocable alarm after bypass expiration.
    e. Post alarm reminder.
    f. Bypass expiration alarm.
    g. Manual/delayed relock.
    h. Unlocked at startup.

2. Manufacturers:

    a. Securitron (SU) – IMXDA Series.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

    a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the

proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.

2.13 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED5000 Series.

2.14 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

    a. Norton Rixson (NO) - 9500 Series.

C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

   a. Norton Rixson (NO) - 7500 Series.
   (Required as part of Blast assembly)

2.15 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48” wide.

1. Provide operators with features as follows:

   a. Non-handed with push and pull side mounting.
   b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
   c. Activation by push button, hands-free or radio frequency devices.
   d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
   e. Two-year limited warranty.
   f. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

   a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
   b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
   c. Infinite Hold Open: Door will hold open at set position until power is turned off.
   d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
   e. Open Delay: Delays operator opening for locking hardware.
   f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
   g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
   h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
   i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.

j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:

a. Norton Rixson (NO) - 6000 Series.

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.18 AUTOMATIC DROP SEALS

Automatic Drop Seals to be of type and design as specified in the Hardware Sets.

2.19 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

a. Securitron (SU) - PB Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

    a. Securitron (SU) - AQL Series.

2.20 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.21 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 088000

GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including, but not limited to, glazing of the following:

1. Windows.
2. Doors.
3. Entrances.
4. Storefront framing.
5. Bullet-resistant glazing.
6. Interior borrowed lites.
7. Interior frameless mirrors.

1.3 RELATED SECTIONS

A. Steel Doors and Frames - Section 081113.

B. Aluminum Entrances and Storefronts - Section 084113.

C. Security Aluminum Entrances - Section 084213.13

D. Security Storefronts - Section 084333.13.

E. Security Windows - Section 085653.

F. Toilet Accessories - Section 102813, for framed bathroom mirrors.

1.4 REFERENCES

A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.

1. FGMA Publications: FGMA Glazing Manual.
2. LSGA Publications: LSGA Design Guide.

3. IGMA Publications: TM-3000 Vertical Glazing Guidelines.

4. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.

5. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

6. ASTM C 920, Standard Specification for Elastomeric Joint Sealants.

7. Insulating Glass Criteria: IGCC International Glass Certification Council.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated on drawings and/or specified herein are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

   a. Specified Design Wind Loads: Per ASCE-7.

2. Probability of Breakage for Vertical Glazing

   a. 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   b. 1 lite per 1000 for lites installed 15 degrees from the vertical and under wind action.
   c. Load Duration: 60 seconds or less.

3. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/100 times the short side length or 1/2", whichever is less.

4. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   a. Temperature Change (Range): 120 deg. F ambient; 180 deg F, material surfaces.

5. Thermal Solar Performance: See Article 2.2 herein.

C. Glass units shall be annealed, heat-strengthened, fully tempered or laminated where required to meet wind and/or snow loads and safety glazing requirements as shown, specified or recommended by the glass fabricator and as required by the 2020 New York State Building Code.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.

B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.

C. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

1. Submit complete range of samples of standard colors and patterns for ceramic frits at insulating glass.

2. Submit complete range of samples of sandblasted glass showing variations of grits and opacity achieved.

D. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.

E. Calculations: Provide wind load charts, calculations, thermal stress analysis, and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied. Document shall be signed and sealed by a Professional Engineer licensed in the State of New York.

F. Test Reports: Provide certified reports for specified tests.

G. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of five years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.

C. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.

1. GANA Publications: GANA's "Glazing Manual" and "Laminated Glass Design Guide."

2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines for Sealed Insulating Glass Units."

E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

F. Safety Glazing Products: Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction. Wherever requirements conflict, the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide Category II materials complying with testing requirements in 16 CFR Part 12 and ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.

a. For glazing types with multiple lites of glass, laminated or assembled into an insulating unit, where safety labeling is required, provide labels that align in position and orientation from lite to lite.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

3. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

G. Insulating Glass Certification Program: Permanently marked on spacers with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

2. Associated Laboratories, Inc.

3. Insulating Glass Manufacturers Alliance.

H. Manufacturer shall be ISO 9001-2000 Certified.

1.8 TESTS

A. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.

1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.

2. Provide manufacturer's written report and recommendations regarding proper installation.

1.9 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.

B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

C. Do not install sealants when substrates are wet or where contaminants capable of interfering with adhesion are present.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

3. Glass shall be delivered to the site bearing the manufacturer's label, complete with glazing instructions where applicable.

4. Comply with insulating glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 WARRANTIES

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.

C. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of the hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

1. Warranty Period: Manufacturer's standard but not less than ten (10) years after date of substantial completion.

D. Manufacturer’s Special Project Warranty on Laminated Glass: Manufacturer’s standard form, made out to Owner and signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty period five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/FABRICATORS

A. All glass and glazing used at the exterior of the Project shall be manufactured by the same manufacturer. The same manufacturer and the same furnace shall be used for all tempered and heat strengthened glass used throughout the project. Acceptable manufacturers include, but are not limited to, the following:

1. Vitro Architectural Glass.

2. Guardian Industries.

3. Pilkington.

4. Viracon.

2.2 GLASS MATERIALS AND PRODUCTS

A. Ultra-Clear (Low-Iron) Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

1. Low Iron Tempered Glass: Provide "Starphire" by Vitro Architectural Glass, or approved equal, tempered in accordance ASTM C 1048, thicknesses as indicated.

B. Clear Float Glass: ASTM C 1036, Type I (transparent, flat), Class 1 (clear), Quality q3, minimum 1/4" thick.

C. Clear Tempered Glass: ASTM C 1048, Condition A (uncoated), Type I (transparent, flat), Class 1 (clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards.

1. Performance Requirements for Tempered Glass

a. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.
b. Diagonal: +/- 3.0 mm.
c. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.
d. Corners: No more than 3.0 mm from square.
e. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.
f. Tempered glass shall have a minimum surface compression of 10,000 psi.
g. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.
h. Flatness Tolerances
1). Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003" as measured per peak to valley for ¼" (6mm) thick glass.
2). Bow and Warp: The bow and warp tolerances shall not exceed 1/32" per linear foot.
3). Fully tempered glass shall be heat soaked to EN 14179-1:2016-European Heat Soaking Standard.

D. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conforming to ASTM C 1172 and as follows:

1. Interlayer Color: Clear.

2. Interlayer Material: Provide Eastman Chemical "Saflex" or "Vanceva," or DuPont "Butacite," 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications.

3. Minimum thickness of 1/4".

E. Insulating Glass: Insulating glass unit shall consist of 1/4" clear exterior lite of float (or tempered, where required) glass with low-E coating on No. 2 face, 1/2" interspace and 1/4" clear interior lite of float (or tempered, where required) glass. Provide factory

assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 2190, and as follows:

1. Sealing System: Dual Seal.

2. Primary Sealant: Polyisobutylene.

3. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, or Dow Corning 982.

    a. For structurally glazed IG units, secondary seal shall conform to ASTM C 1249.
    b. Primary and secondary seals shall not contain voids and must be continuously bonded to the glass structure.

4. Spacer: Clear finish aluminum with welded, soldered, or bent corners, hollow tube types, filled with low nitrogen absorption desiccant.

5. Desiccant: Molecular sieve, silica gel, or blend of both.

6. Interspace Content: Argon.

7. Air Space Thickness: 1/2".

8. Glass Thickness: 1/4" minimum.

9. Low-E Coating: Provide high-performance, clear, metallic coating, VE1-2M as manufactured by Viracon or approved equal. Provide low-E coating having the following performance characteristics when applied to the No. 2 surface of 1" insulating units, both lites 1/4" clear:

    a. Visible Light Transmittance: 70%.
    b. Solar Energy Transmittance: 33%.
    c. Solar Heat Gain Coefficient (SHGC): 0.38.
    d. U-Value: 0.29 winter, 0.26 summer.

10. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) or by IGMA, and tested in accordance with the above ASTM Test Methods.

11. Insulating glass shall conform to the following tolerances:

    a. Length and Width: + 3.0 mm/ -2.0 mm.
    b. Diagonal: +/- 3.0 mm.
    c. Thickness: As agreed +/- 1.0 mm.
    d. Edge-Deletion of Coating: Minimum 8 mm wide. Width of deletion must be more than the width of the secondary seal. Silver layer(s) must be completely removed. Appearance must be uniform.
    e. Primary PIB Seal: Must be complete with no breaks. Appearance must be uniform. PIB bead must overlap coating. No visible bright line when glass is viewed in transmission. The width of the PIB bead shall be 4.0 mm + 3.0/ - 1.5 mm.

f. Secondary Seal: Nominal 6 mm + 3.0/ - 1.5 mm. The minimum width of the secondary silicone seal for IG units that are glazed structurally must be determined according to ASTM C 1249. The secondary seal must be uniformly applied without bubbles, cavities or gaps. Avoid excess sealant that will need to be trimmed off later.

12. Additional requirements and properties for primary and secondary insulating glass seals and spacers:

a. All glass units shall comply with IGMA Guidelines which limits the dimension of the visible edge seal encroachment into the vision area to be no greater than the sightline infringement of 3mm (0.12").
b. Insulating glass unit hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be aluminum or stainless steel. Locate spacer joint at the top or sides of the units, but in no instances at the sill. Design units to minimize the number of spacer joints. Provide solid keys, embedded in butyl sealant on all four sides, at spacer joints.
c. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8" to 3/16". Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal shall not be less than 1/16", and the total cumulative length of the primary seal between 1/16" and 1/8" shall be less than 12" in any one insulating glass unit. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.
d. Provide secondary seal of uniform depth with a nominal width of ¼". Provide a total width of the primary and secondary seal of ½". Units shall meet IGMA 65-7-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

F. Wire Glass: ASTM C 1036, UL Listed, Fire Rated polished transparent wire glass complying with ANSI Z97.1. Provide Type II - Patterned and Wired Glass, Class 1 (clear), Quality q8 (Glazing), Form 1 (polished both sides), and as follows:

1. Thickness: 1/4" unless otherwise indicated or required.

2. Square Pattern: Mesh M2.

G. Fire-Rated Glazing Material: Proprietary product in the form of clear flat sheets of 3/16" nominal thickness weighing 2.5 lb./sq. ft., and as follows:

1. Fire Protection Rating: As required by Code for the fire rated opening in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

2. Product: "Premium FireLite" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

H. Bullet-Resistant Security Glazing

1. Basis-of-Design Product: Subject to compliance with requirements, provide Insulgard Security Products' "BulletBlock HP600."

2. Ballistic Resistance: Level 5, designed to withstand at least one 7.62mm rifle FMJ with a velocity of at least 2750f/s in accordance with UL 752.

3. Glazing: 1/4" clear, tempered Pilkington Energy Advantage Hard Coat Low-E #2 glass + 1/2" air space + 1.28" clear ARMOR-GARD BALULN32 BR LAM, U.L. tested Level 5 with edge seal and BulletBlock HP500 painted full vision door glazed with 1.28" clear ARMOR-GARD BALULN32 BR LAM, U.L. tested Level 5 with edge seal.

4. Maximum Overall Unit Thickness: 1-3/8".

I. Frameless Mirrors: 1/4", Quality q2, clear float glass with silver, copper, and organic coating, edges uniformly ground and polished.

2.3 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:

1. Dow Corning 795.

2. General Electric Silglaze N 2500 or Contractors SCS-1000.

3. Tremco Spectrem 2.

C. Weather Seal Sealant: Provide non-acid curing sealant with movement range $\pm$ 50%, ASTM C 719. Provide one of the following:

1. Dow Corning 795.

2. General Electric Silpruf.

3. Tremco Spectrem 2.

D. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.

E. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75$\pm$5 for hollow profile, and 60$\pm$5 for solid profiles, ASTM C 864.

F. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40$\pm$5, and 20% to 35% compression, ASTM C 509; Type II.

G. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C 1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form. Provide Tremco "Polyshim II" or approved equal.

H. Setting Blocks: Provide 100% silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.

I. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

J. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

K. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

L. Mirror Adhesive: Palmer's "Mirro-Mastic," or approved equal. Mastic must be compatible with mirror backing.

1. Clips: No. 4 finish Type 304 stainless steel.

2.4 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine glazing framing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep system.

3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the GANA "Glazing Manual."

B. Verify that Insulating Glass Unit (IGU) secondary seal is compatible with glazing sealants.

C. Install glass in prepared glazing channels and other framing members.

D. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA's "Glazing Manual" and IGMA's "Glazing Guidelines."

E. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by GANA's "Glazing Manual."

F. Provide weep system as recommended by GANA's "Glazing Manual."

G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

H. Distribute the weight of glass unit along the edge rather than the corner.

I. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.

J. Protect glass edge damage during handling and installation.

K. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.

L. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead. Install setting blocks at the one greater points of each lite along the horizontal mullion.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Flush Glazing

1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.

3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.

2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.

4. Set edge block according to glass manufacturer's recommendations.

5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.

6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.

7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces

of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Exterior glazing gasket shall be set a minimum of 1/8" below exterior glazing stop to create a channel for sealant installation.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 FRAMELESS MIRRORS

A. Apply mastic to back of mirror "pats" spaced 4 pats/sq. ft.; adjust mirror so that it is plumb and in place to avoid distortion of reflecting images. Allow 1/8" space between back of mirror and wall surface.

1. Apply "pats" using Palmer Electric Applicator.

B. Apply stainless steel clips at mirror top and bottom; securely clip to substrate using non-corrosive anchors. At drywall back-up anchors must be secured to studs or steel wallplate spanning from stud to stud.

3.9 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Cleaning: Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

1. Glass shall be cleaned according to:

a. GANA Glass Information Bulletin GANA 01-0300 – "Proper Procedure for Cleaning Architectural Glass Products."
b. GANA Glass Informational Bulletin GANA TD-02-0402 – Heat Treated Glass Surfaces are Different."

2. Do not use razor blades, scrapers, or metal tools to clean glass.

END OF SECTION 088000

SECTION 089000

LOUVERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the louvers as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Aluminum louvers.
2. Blank-off panels.
3. Bird screens.

1.3 RELATED SECTIONS

A. Joint Sealers - Section 079200.

B. Louvers connected to ductwork - Division 23.

1.4 QUALITY ASSURANCE

A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and snow and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter or permanent damage to fasteners and anchors.

1. Wind Load: ASCE-7 or 2020 New York State Building Code, whichever is more stringent.

B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

1. Temperature Change (Range): 120 deg. F., ambient; 180 deg. F, material surfaces.

C. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

D. Field Measurements: Verify size, location, and placement of louver units prior to fabrication.

E. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints, and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Louvers shall be tested and certified in accordance with AMCA 500-L and approved to bear the AMCA 550 listing label for High Velocity Wind Driven Rain Resistant Louvers.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, certified test data, where applicable, and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery, and other information to determine compliance with specified requirements.

C. Samples: Submit six (6) inch square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two (2) or more units in each sample showing limits of such variations.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the professional engineer licensed in the State of New York responsible for their preparation.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 WARRANTY

A. Finish shall be warranted for a period of 20 years, starting from date of Substantial Completion of the Project.

PART 2 PRODUCTS

2.1 LOUVER MATERIAL

A. Provide storm-resistant, fixed horizontal louvers as manufactured by Airolite, Construction Specialties, Inc., Greenheck, Ruskin, or approved equal meeting these specifications.

B. Material: Heads, sills, jambs, and mullions shall be one-piece structural aluminum members. Louver shall be a 9-inch-deep system, consisting of a horizontal front blade and a vertical rear blade in a drainable frame. Louvers shall be supplied with 6-inch-high by full depth sill flashings formed from minimum 0.050" thick aluminum. Sill flashings shall have welded side panels. Louvers and sill flashings shall be installed in accordance with the manufacturer's recommended procedures to ensure complete water integrity performance of the louver system.

C. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.

1. Fluoropolymer Two-Coat System: Manufacturer’s standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Custom color and gloss as selected by the Architect.

D. Bird Screens

1. All louvers to be furnished with bird screens, finish to match louvers.

2. Screens to be 5/8" mesh, 0.050" thick expanded and flattened aluminum bird screen secured with 0.055" thick extruded aluminum frames. Frames to have mitered corners and corner locks.

E. Blank-Off Panels: Blank-off panels shall be 2" thick and faced on both sides with 0.032" thick aluminum sheet. Panels shall be fabricated with an expanded polystyrene (EPS) core having an R-value of 8. Panel perimeter frame shall be 0.050" thick formed aluminum channels. Panel frame shall be mitered at the corners. Panels are to be finished to match louvers.

F. Fastenings: Fasteners for exterior application shall be stainless steel. Provide types, gauges, and lengths to suit unit installation conditions. Use Phillips flat head machine screws for exposed fasteners, unless otherwise indicated.

G. Anchors and Inserts: Use non-ferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

H. Bituminous Paint: SSPC-Paint 12 (cold applied asphalt mastic).

2.2 LOUVER FABRICATION, GENERAL

A. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide sill extensions made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

D. Join frame members to one another and to stationary louver blades by welding or mechanical fasteners, as standard for the manufacturer, except where indicated otherwise or where field bolted connections between frame members are necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where louvers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for the installation of anchorages which are to be embedded in masonry construction. Coordinate the delivery of such items to the project site.

3.3 INSTALLATION

A. Comply with manufacturer’s instructions and recommendations for installation of the work.

B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designated, fabricated and fitted to the structure.

C. Anchor louvers to the building substructure.

D. Erection Tolerances:

1. Maximum variation from plane or location shown on the approved shop drawings: 1/8” per 12 feet of length, but not exceeding ½” in any total building length or portion thereof (non-cumulative).

2. Maximum offset from true alignment between two members abutting end to end, edge to edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no-load conditions.

E. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

F. Do not erect warped, bowed, deformed, or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

G. Set units level, plumb and true to line, with uniform joints.

3.4 PROTECTION

A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

3.5 ADJUSTING AND CLEANING

A. Immediately clean exposed surfaces of the louvers to remove fingerprints and dirt accumulation during the installation process. Do not let soiling remain until the final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to the material finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective wok. If results of restoration are unsuccessful, as determined by the Architect, remove damaged materials and replace with new materials.

1. Touch up minor abrasions in finishes with a compatible air-dried coating that matches the color and gloss of the factory applied coating.

END OF SECTION 089000

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 092313

SEAMLESS ABSORPTIVE PLASTER

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the seamless absorptive plaster as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000.

B. Gypsum Drywall - Section 092900.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualification: At least 3 years' experience fabricating and installing comparable work, employing skilled mechanics under competent supervision for all phases of the Work.

B. Special Experience Requirements: The contractor or subcontractor who will perform the specific areas of work specified above must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work. In addition, the contractor of subcontractor must be approved by the manufacturer.

1.5 SUBMITTALS

A. Shop Drawings/Product Data

1. Base drawings on field measurements.

2. Show dimensioned wall elevations with seam and joint locations, cutout sizes and locations, anchor locations, relation to adjacent work; large scale joint and mounting details; materials type, weight/thickness, design, color; and other data necessary to fabricate and install work and coordinate work with affected trades.

B. Mock-up: Provide full-size mockup including 2 connections and prefabricated corners demonstrating different geometric corners and shapes for Architect's approval.

C. Certification

1. Acoustical Performance: Certified reports of acoustical performance tests conducted and/or witnessed by a recognized, independent, testing agency. Tests shall have been done by specified methods or recognized equivalent. Sound absorption tests shall be not more than three years old. Reports on earlier tests are acceptable if it can be established to the Architect's satisfaction, that they are valid indications of compliance with Project requirements.

2. Fire Hazard: Evidence of compliance with regulatory agency and specifications requirements.

D. Cleaning and Maintenance Instructions: Recommendations for Owner maintenance and cleaning per General Requirements. Identify cleaning/spotting products generically or by trade name.

1.6 REFERENCES

A. ASTM C 423: Test for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E 84: Test for Surface Burning Characteristics of Building Materials.

1.7 DELIVERY, STORAGE AND HANDLING

A. Allow materials to become acclimated to Project conditions before installation as necessary to prevent sag and distortion during service life.

1.8 ENVIRONMENTAL CONDITIONS

A. Work areas shall be at or near ambient occupancy temperature and relative humidity.

B. Painting, dust-raising activities, and work that introduces dampness shall be completed.

PART 2 PRODUCTS

2.1 MATERIAL

A. Basis of Design: The field-applied, Seamless Absorptive Plaster shall be BASWAphon as supplied by BASWA Acoustic North America, LLC, 21863 Aurora Rd., Cleveland, OH 44146. Acceptable Alternates: Fellert Silk, Pyrok StarSilent or approved equal.

1. Finish: Classic Fine.

2. Products below are those of BASWAphon as basis of design. Provide named products or comparable products of other manufacturers listed or approved equal.

B. Sound Absorbing Plaster System shall be provided in a total system thickness (adhesive, pre-coated mineral wool panels, Base 407 Coat and Fine Coat) of approximately 70mm.

C. Sound Absorbing Plaster System shall consist of pre-coated mineral wool supporting panels, panel adhesive, Fill, a base coat and a finish coat.

D. Trim Pieces: All corner beads, reveals, terminations, control joints or other trim pieces shall be white vinyl, manufactured by Trim-Tex or Vinyl Corp., in profiles approved by manufacturer. Trims shall be installed with Trim-Tex 847 Spray Adhesive; no other adhesive is acceptable.

E. The base and fine coats shall be integrally colored by the addition of pigments provided by the manufacturer. Color: As selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine areas where and conditions under which seamless absorptive plaster is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected to permit the proper installation of the work.

B. All substrates for the application shall not vary from plumb, level or smooth consistent curvature more than 1/4 inch in 12 feet.

C. Verify that all mechanical and electrical services within area of application has been tested and approved, prior to commencement of application.

3.2 INSTALLATION

A. Install materials in accordance with the manufacturer's installation instructions and details. Installation shall start only after all other work in the area of the installation has been completed.

B. Install a field applied adhesive layer 3-mm thick, using adhesive and methods in accordance with manufacturer's installation instructions to the 63-mm thick pre-coated panels and adhere panels to stable substrate. Ensure that panels are set as level and as smooth to each other as practicable.

C. Install Trims with approved adhesives and cover with Pre-Coat.

D. Fill seams with Pre-Fill, sand Pre-Fill on panel seams and Pre-Fill on Trim completely smooth when dry.

E. Apply a 1.5-mm thick layer of Base-Coat 407, trowel smooth, sand completely smooth when dry.

F. Apply a 0.5-mm thick layer of Top-Coat and trowel smooth to a quality level consistent with accepted samples or mock-up. Note that coating is a hand troweled finished product. Inherent in all hand-troweled product applications, minor trowel marks in the finished surface may occur. Critical lighting may expose minor trowel marks inherent in all hand troweled products. The finish should be viewed under end-use lighting conditions.

END OF SECTION 092313

SECTION 092423

SYNTHETIC STUCCO

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the synthetic stucco as shown on the drawings and/or specified herein.

1. Synthetic stucco applied over concrete unit masonry.

2. Metal lath at vertical substrates.

1.3 RELATED SECTIONS

A. Concrete Forming – Section 031000.

B. Unit Masonry - Section 042000.

1.4 QUALITY ASSURANCE

A. Provide a preconstruction meeting with Contractor, Construction Manager, Architect, and manufacturer representative to discuss the site conditions and installation prior to commencement of the work.

B. Manufacturer Requirements

1. Stucco products manufacturer for a minimum of 20 years.

2. Stucco finish products manufactured under ISO 9001 Quality System.

C. Contractor Requirements

1. Licensed, insured, and engaged in application of synthetic stucco systems for a minimum of 3 years.

2. Knowledgeable in the proper use and handling of manufacturers materials.

3. Employ skilled mechanics who are experienced and knowledgeable in Synthetic stucco application, and familiar with the requirements of the specified work.

4. Successful completion of minimum of 3 projects of similar size and complexity to the specified project.

5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with manufacturer’s published specifications and details and the project plans and specifications.

D. Inspections: Provide independent, third-party inspection and code compliance.

E. Mock-Up: Provide 5' x 5' mockup of anticipated finish, for Architect’s review prior to commencement of the work.

1.5 SUBMITTALS

A. Submit the following for Architect’s review:

1. Manufacturer's specifications, details, installation instructions and product data.

2. Manufacturer’s code compliance report.

3. Manufacturer's standard warranty.

4. Samples for approval as directed by Project Architect.

5. Prepare and submit project-specific details at all interfaces with adjacent wall assemblies, at all penetrations.

6. Manufacturer’s letter indicating stucco contractor is certified to installl this system and provide warranty.

1.6 DELIVERY, STORAGE, HANDLING

A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing and temperatures in excess of 90°F. Store away from direct sunlight.

C. Protect Portland cement-based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.7 PROJECT CONDITIONS

A. Protect Portland cement-based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

B. Provide supplementary heat for installation in temperatures less than 40°F. Prevent concentration of heat on uncured stucco and vent fumes and other products of combustion to the outside to prevent contact with stucco.

C. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist cure the stucco.

D. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.8 MANUFACTURER'S WARRANTY

A. Provide manufacturer's standard 7-year warranty.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Joints:

1. Provide expansion joints in the stucco system where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas.

2. Provide expansion joints at through wall penetrations, for example, above and below doors or windows.

3. Provide appropriate accessories at stucco terminations and joints.

B. Sealant: Provide appropriate sealant at stucco terminations.

2.2 STUCCO SYSTEM

A. Provide "StoPowerwall NExT System" with air barrier, metal lath and finish system as manufactured by Sto Corp., or approved equal. (Sto products are specified as the basis for the project design.)

1. Provide waterproofing/air barrier, stucco, primer, and finish from single source manufacturer.

B. Waterproofing/ Air Barrier: StoGuard fluid applied waterproofing/air barrier for sheathing substrates consisting of three components:

1. Sto Gold Fill: Ready mixed acrylic based flexible joint treatment for rough opening protection, joint treatment of wall sheathing, and connections with flashing.

2. Sto GoldCoat: Ready mixed flexible waterproof coating for wall sheathing

3. StoGuard Mesh: Nominal 4.2 oz/yd^2, self-adhesive, flexible, symmetrical, interlaced glass fiber fabric, with alkaline resistant coating for compatibility with Sto materials (used with Sto Gold Fill® to reinforce rough openings, inside and outside corners, sheathing joints, and connections with flashings)

C. Slip Sheet: A minimum of 15 lb. asphalt saturated felt complying with ASTm D226, Type 1.

D. Lath: Minimum 2.5 lb./yd^2 self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C 847.

E. Mechanical Fasteners: Provide minimum #8 wafer head fully threaded stainless steel screws with a minimum of 1 inch penetration. Install at rate per manufacturer requirements.

F. Accessories: Weep screed, casing bead, corner bead, corner lath, expansion and control joint accessories. All accessories shall meet the requirements of ASTM C 1063 and its referenced documents:

1. PVC plastic in compliance with ASTM D 1784, cell classification 13244C.

2. All accessories shall have perforated or expanded flanges and shall be designed with grounds for the specified thickness of stucco.

G. Job Mixed Ingredients

1. Water: Clean and potable.

2. Clean, well graded sand free of deleterious materials in compliance with ASTM C 897.

3. Stucco Admixture: Sto Bonding Agent - water based acrylic resin admixture for Sto Powerwall Stucco.

H. Stucco: Sto Powerwall Polymer Modified Stucco: Polymer-modified, factory proportioned, fiber reinforced Portland cement-based stucco, field mixed with graded sand (ASTM C 897), water and Sto Bonding Agent.

I. Primer: "Sto Hot Prime," acrylic-based, tinted, high-pH compatible primer/sealer.

J. Finish Coat: "Sto Limestone Finish," created using Sto Powerflex two coat elastomeric finishes; color as selected by the Architect.

2.3 MIXING

A. StoGuard

1. Sto Gold Fill: Mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.

2. Sto GoldCoat: Mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.

B. Sto Bonding Agent: No mixing required when used as a bonding agent. Shake sealed container before use to a homogeneous consistency.

C. Sto Powerwall Polymer Modified Stucco: Dilute Sto Bonding Agent with 3 parts water to one part Sto Bonding Agent by volume by adding clean, potable water to Sto Bonding Agent in a clean mixing pail and mixing with a high speed electric drill mixer. Follow normal mix ratio and procedures as recommended by Sto.

D. Primer: Mix with a clean, rust-free high-speed mixer to a uniform consistency.

E. Finish: Mix with a clean, rust-free high-speed mixer to a uniform consistency. A small amount of water may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.

F. Mix only as much material as can readily be used.

G. Do not use anti-freeze compounds or other additives.

PART 3 EXECUTION

3.1 INSPECTION

A. Comply with manufacturer's requirements.

B. Report deviations from the requirements of project specifications or other conditions that might adversely affect the stucco installation to the General Contractor.

3.2 SURFACE PREPARATION

A. Comply with manufacturer's requirements.

B. Prepare concrete and CMU surfaces following manufacturers requirements.

C. Joints

1. Provide expansion joints in the stucco system where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas.

2. Provide expansion joints at through wall penetrations, for example, above and below doors or windows.

3. Provide appropriate accessories at stucco terminations and joints.

4. Provide appropriate sealant at stucco terminations.

3.3 WATERPROOFING/AIR BARRIER INSTALLATION

A. NOTE: The waterproofing/air barrier installation described below is one component of the air barrier system for the building envelope and the moisture protection of the wall construction. Installation of the waterproofing/air barrier must be integrated with other air and moisture barrier components in the construction. This requires coordination with other trades to ensure proper sequencing of work, to achieve air barrier continuity, and to direct rainwater to the exterior, not into the wall assembly. Always protect rough openings in wall construction BEFORE installing windows, doors, louvers, etc. Where water is likely to penetrate the wall assembly, such as windows, flashing must be installed to direct water to the exterior at the leak source.

1. StoGuard Mesh: StoGuard Mesh is a self-stick glass fiber reinforcing mesh with adhesive on one side to facilitate placement of the mesh and installation of Sto Gold Fill over the mesh. Place minimum 4 inch (101 mm) wide mesh at sheathing joints and minimum 9 inch (152 mm) wide mesh at rough openings and inside and outside corners (refer to Sto details 5.09E and 5.23aE). Immediately apply Sto Gold Fill by spray or trowel over the mesh and trowel smooth. Protect from rain and freezing until dry.

2. Coordinate installation of connecting waterproofing/air barrier components, for example at expansion joints, penetrations, openings, foundation, and roof, with other trades to provide a continuous airtight membrane and moisture protection.

3. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).

4. Note that some flashing components such as window or door head flashing, roof sidewall step flashing, and weep screeds at the base of the wall, require a splice strip of reinforcing mesh, joint treatment, and waterproofing. This creates a “shingle lap” and proper shedding of water onto the face of the flashing, not behind the flashing (refer to Sto details 5.09E and 5.23bE).

B. NOTE: Do not allow waterproofing/air barrier installation to remain exposed more than 60 days. Protect with stucco wall covering promptly after installation.

3.4 INSTALLATION

A. Lap lath 1" at ends and 2" at laps. Fasten lath to masonry with 1" long nail drive anchor with 2" dia. galvanized plate equal to "Zamac Nailin" made by Rawl or approved equal space 8" o.c. both directions.

B. General

1. The System shall be installed in accordance with the current STO application guides.

2. Install casing beads at stucco terminations and other through soffit penetrations. Install two-piece expansion joints (or back-to-back casing beads) at joints in the supporting construction, building expansion joints, where the stucco is to be installed over dissimilar construction or substrates, at columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces. Seal adjoining pieces by embedding ends in sealant.

3. Install control joints in accordance with ASTM C 1063.

C. One Piece Expansion/Control Joint Installation: Cut lath in a straight line with shears at expansion/control joint location. Do not cut into or damage moisture barrier. Install one piece expansion/control joints over lath at through wall penetrations, for example, above and below doors or windows (unless another type of expansion joint is already provided at these locations). Install one-piece expansion/control joints over lath in

pattern indicated on drawings but not greater than every 144 sq. ft. Wire tie one-piece expansion/control joints to cut lath at no more than 7 inches on center. Make certain lath is discontinuous beneath joints. Do not exceed length to width ratio of 2:1 in expansion/control joint layout and do not exceed more than 18 feet in any direction without an expansion/control joint.

D. Inside and Outside Corners: Bend lath at inside corners and extend minimum 24 inches (610 mm) past corner. Attach through lath into framing at no more than 7 inches (178 mm) on center with appropriate fasteners. Alternatively, butt lath at corners and attach corner lath at no more than 7 inches (178 mm) on center into framing with appropriate fasteners. Install corner bead at outside corners over lath. Attach at no more than 7 inches (178 mm) on center intro framing with appropriate fasteners.

E. Stucco Installation

1. Scratch Coat: apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 – 1/2 inch (9-13mm), to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.

2. Brown Coat: as soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Alternatively, moist cure the first coat up to 48 hours and dampen the scratched surface with water immediately before applying the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be minimum 1/2 inch (13 mm), maximum 1 inch (22 mm) as required by project conditions and specifications. Stucco shall be uniform in thickness throughout the wall area.

3. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface.

F. Primer Installation: Apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and foam build-outs, and allow to dry thoroughly before applying finish.

G. Finish Installation: Apply finish directly over the primed stucco and foam build-outs when dry. Apply finish by spraying or troweling with a stainless steel trowel, depending on the finish specified. Follow these general rules for application of finish:

1. Avoid application in direct sunlight.

2. Apply finish in a continuous application and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.

3. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working

time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.

4. Float "R" or swirl finishes with a plastic float to achieve their swirl texture.

5. Do not install separate batches of finish side-by-side.

6. Do not apply finish into or over joints or accessories. Apply finish to outside face of wall only.

3.5 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.

C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.

END OF SECTION 092423

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.
2. Metal supports for gypsum drywall construction.
3. Acoustical insulation for gypsum drywall work.
4. Sealant for gypsum drywall work.
5. Concealed metal reinforcing for attachment of railings, toilet partitions, and other items supported on drywall partitions and walls.
6. Taping and finishing of drywall joints.
7. Installing rings and frames in drywall surfaces for grilles, registers, and lighting fixtures.
8. Bracing and connections.

1.3 RELATED SECTIONS

A. Thermal Insulation - Section 072100.

B. Hollow metal door frames - Section 081113.

C. Access Doors - Section 083113.

D. Painting and Finishing - Section 099000.

E. Rings for grilles, registers, and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.
2. Construction Guide, latest edition, National Gypsum.
3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"
5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"
10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"
11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
14. ASTM C 1396 "Standard Specification for Gypsum Board"
15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"

B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.

C. System Design Load

1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.
    a. Drywall assemblies with tile finish shall have a deflection limit of L/360.
2. Provide drywall ceiling assemblies designed, fabricated, and installed to have a deflection not to exceed L/360.

D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

F. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.5 SUBMITTALS

A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.

B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.

D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

E. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.6 PRODUCT HANDLING AND PROTECTION

A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.

B. Protect wallboard from becoming wet.

C. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice."

1.7 ENVIRONMENTAL CONDITIONS

A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall

work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.

B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.

C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Continental Building Products, or National Gypsum Co. meeting specification requirements are acceptable.

1. All drywall products must be manufactured in North America.

B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

A. Metal Floor and Ceiling Runners

1. Drywall Track: Formed from 0.0312 inch (20 U.S. Std. gauge) (minimum unless otherwise noted or required by performance requirements) cold formed steel, width to suit shaped metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.

2. Deflection track or head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 0.0312 (20 ga.) cold formed steel for clips, 25 ga. cold formed steel for deflection track.

a. Product: "BlazeFrame DSL" or "MaxTrak Slotted Deflection Track" as manufactured by ClarkDietrich, "VertiClip" or "VertiTrack" as manufactured by the Steel Network or equal made by Metal-Lite Inc.
b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.

B. Metal Studs, Framing and Furring

1. C-Shaped Studs: Channel type with holes for passage of conduit formed from minimum 0.0312" (20 U.S. Std. gauge) (unless heavier gauge is required to meet deflection limits) cold formed steel, width as shown on drawings.

2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.

a. Product: ClarkDietrich; Furring Channel, or a comparable product.

3. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions, and other items supported on drywall partitions and walls.

C. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.

2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.

3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.

4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.

5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

D. Protective Coating: All cold-formed steel members shall have coating conforming to AISI S220; ASTM A 653, G60 or coating with equivalent corrosion resistance of ASTM A653/A653M, G60. Galvannealed products are not acceptable.

2.3 GYPSUM WALLBOARD TYPES

A. Gypsum Wallboard: 5/8" thick "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

B. Gypsum Ceiling Board: 5/8" thick, sag-resistant, long edges tapered.

C. Fire-Rated Gypsum Wallboard: 5/8" thick "Sheetrock Firecode C" by USG, "Firecheck Type C" by Lafarge/Continental, "Gold Bond Fireshield" by National Gypsum, or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

D. Water-Resistant Backing Board for Tile Finish: 1/2" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific or "DiamondBack Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.

E. Cement Board Backing for Tile Finish at Showers: 1/2" thick "Durock Tile Backer Board" by USG, "Wonder Board Lite" by Custom Building Products or approved equal.

F. Mold-Resistant Paperless Gypsum Wallboard: 5/8" thick, 48" wide "DensArmour Plus" and "DensArmour Plus Fireguard C" by Georgia Pacific, or equal by National Gypsum, USG or approved equal that has a rating of 10 per ASTM D 3273 with core that meets ASTM C 1396, Section 6 or ASTM C 1658.

G. Moisture/Mold-Resistant Gypsum Wallboard (at all exterior walls and wet areas): 5/8" thick "Mold Tough," "Mold Tough FR," by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, "Mold Defense" and/or "Mold Defense Type X" by Lafarge/Continental, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6, or ASTM C 1658.

H. Abuse-Resistant Wallboard: 5/8" thick "Sheetrock Brand Mold Tough AR" by USG, "Dens Armor Plus Abuse Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme AR" or "Gold Bond Brand Hi-Abuse XP" by National Gypsum, "Protecta AR100" or "Protecta HIR 300" by Lafarge/Continental, or "AirRenew Extreme Abuse" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must achieve a Level 1 rating per ASTM C 1629.

2.4 ACCESSORIES

A. Acoustical Fire Batt Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, ASTM C665, Type I; minimum fire hazard classification rating of 0/0 per ASTM E84; minimum 3-inch thick; 2-1/2 inches thick for installation in 2-1/2 inch stud cavities; widths to friction-fit between studs, where indicated for installation in stud walls; formaldehyde free; 3 lb./cu. ft. maximum density;

1. Owens-Corning "Thermafiber SAFB"

2. Rockwool "Rockwool AFB"

3. Or approved equal.

B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

1. For Portland cement base boards, fasteners shall be equal to Durock Steel Screws by U.S. Gypsum.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

D. Metal Trim - Corner Beads: For 90 degree external corners, provide ClarkDietrich "103 Deluxe Corner Bead (CBU)" or "103 Dur-A-Bead" by USG, 26 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4".

E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."

F. Partition/Concrete Ceiling Trim: Trim-Tex Super Seal Tear Away or approved equal.

G. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.

1. For mold-resistant drywall, water-resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or "Rapid Joint" manufactured by Lafarge North America or approved equal meeting standards noted herein.

H. Control Joints: ClarkDietrich; #093 Control Joint or No. 0.093 by USG.

I. Acoustical Sealant: Non-hardening, low-shrinkage; for use in conjunction with gypsum board; maximum VOC content 250g/L: USG "Acoustical Sealant," Tremco Mfg. Co. "Tremco Acoustical Sealant," BASF "MasterSeal NP520," or approved equal.

J. Neoprene Gaskets: Conform to ASTM D 1056.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.

3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span

between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.

2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wallboard Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."

2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use sag-resistant board for ceilings. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.

4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.

5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.

7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.

8. Screw fasten wallboard with power-driven electric screwdriver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.

9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.

2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.

3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.

2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

H. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.

2. Construction changes within the plane of the partition or ceiling.

3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.

5. Wings of "L," "U," and "T" shaped ceiling areas are joined.

6. Expansion or control joints occur in the structural elements of the building.

7. Partition or furring abuts a structural element or dissimilar wall or ceiling.

8. Partition or furring runs exceed 30' without interruption.

9. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

I. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.

2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.

B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

C. Stud Installation

1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.

3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.

4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.

5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.

7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.

8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

E. Wallboard Installation - Single Layer Application (Screw Attached)

1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.

2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.

4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.

5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.

2. First Layer (Screw Attached): Install as described above for single layer application.

3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip

connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

J. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.

2. Back by double framing members.

3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.

4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.

1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.7 FINISHING

A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840 and GA-214 of the Gypsum Association.

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 2: Panels that are a substrate for tile, and where indicated.

3. Level 4: Level of finish for surfaces exposed to view shall conform to Level 4.

G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.8 CLEANING AND ADJUSTMENT

A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools, and other equipment shall be removed from the building.

B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.

C. Cutting and Repairing: Include all cutting, fitting, and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work and leave all work complete and perfect after all trades have completed their work.

3.9 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 092900

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 093013

CERAMIC TILING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ceramic tiling work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Ceramic floor tile.

2. Ceramic wall tile and base.

3. Stone saddles.

4. Setting beds, grout and sealant.

5. Waterproofing membrane.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 033000.

B. Unit Masonry - Section 042000.

C. Gypsum Drywall - Section 092900.

1.4 REFERENCES

A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.

B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.

C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.

D. ASTM C 150 - Standard Specification for Portland Cement.

E. TCNA - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.

F. ISO 13007 - International Standards Organization; Classification for Grout and Adhesives.

G. Large Format Tile (LFT): Tile 15" or larger in any direction and/or 144 sq. in. in size.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and the installers are Certified Ceramic Tile Installer (CTI) through the Ceramic Tile Education Foundation (CTEF) or Tile Installer Thin Set Standards (ITS) verification through the University of Ceramic Tile and Stone.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:

1. Manufacture all ceramic tile in accordance with Standard Grade Requirements of ANSI A-137.1.

2. Install all ceramic tile in accordance with the recommendations contained in "Tile Council of North America Handbook for Ceramic, Glass, and Stone Tile Installation (TCNA)," latest edition.

C. Flooring surfaces shall have a minimum wet DCOF AcuTest value of 0.42 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1.6 SUBMITTALS

A. Samples

1. Before any ceramic tile is delivered to the job site, submit to the Architect sample panels, approx. 12" x 12", mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.

2. Submit 6" length of stone saddles.

3. Submit 12" x 12" samples of waterproofing membrane.

B. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

C. Mock-Ups

1. At an area on the site where approved by the Architect, provide a mock-up ceramic tile installation.

a. Make the mock-up approximately 36" x 36" in dimension.
b. Provide one mock-up for each type, class, and color of installation required under this Section.
c. The mock-ups may be used as part of the Work and may be included in the finished Work when so approved by the Architect.
d. Revise as necessary to secure the Architect's approval.

2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

1.7 PRODUCT HANDLING

A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store all materials under cover in a manner to prevent damage and contamination; store only the specified materials at the job site.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2. Obtain waterproof/crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.

2. Waterproof membrane.

3. Metal edge strips.

2.2 MANUFACTURERS OF TILE

A. Provide as scheduled on the drawings from Dal-Tile Corp., American Olean, United States Ceramic Tile Co., Summitville Tiles Inc., or approved equal meeting these specifications. The Architect reserves the right to pick tile from any price group.

2.3 TRIM AND SPECIAL SHAPES

A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

2.4 STONE SADDLES

A. Provide sound stone of variety selected by the Architect, minimum 3/4" thick, with an abrasive hardness of not less than 10.0, when tested in accordance with ASTM C 241. Cut saddle to fit jamb profile, honed finish.

2.5 SETTING BEDS AND GROUT

A. Portland Cement: ASTM C 150, Type 1.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean and graded natural sand.

D. Reinforcing for Mud Set Systems: 2" x 2" x 16/16 ga. welded wire mesh.

E. Latex Modified Mortar Bed

1. Laticrete 3701 Fortified Mortar Bed.

2. MAPEI, Modified Mortar Bed.

3. Pro Spec, Floor Mud with B-710 SBR Acrylic Additive.

F. Latex-Portland Cement Bond Coat, complying with ANSI A118.4 and ISO 13007, C2ES2P1 with minimum compressive strength of 400 psi.

1. Laticrete, 254 Platinum.

2. MAPEI, Keraflex Super.

3. Pro Spec; Permalastic System consisting of Permalastic Dryset Mortar and Permalastic Admixture.

G. Improved Modified Cement Mortars: For use with large format tile (LFT), complying with ANSI 118.15 and ISO 13007, CSES2PS.

1. Laticrete, MultiMax Lite.

2. Mapei; Keraflex Super.

3. Pro Spec; StayFlex 590.

H. Wall and Base Tile

1. Over masonry and concrete, use a mortar bed leveling coat conforming to ANSI A108.1A followed by a Latex Portland Cement Bond Coat: Laticrete "TriLite," MAPEI "Keraflex Super," or equal by Pro Spec, conforming to ANSI A118.4, ISO 13007-C2ES2P1, and TCA Detail W-211.

2. Over cement board, use a Latex Portland cement mortar bond coat: Laticrete "TriLite," MAPEI, "Keraflex Super," or equal by Pro Spec, conforming to ANSI A118.4, ISO 13007-C2ES2P1, and TCA Detail W-244; coat back of board with waterproof membrane as specified below.

3. Over glass-mat, water-resistant gypsum backer board, use a latex Portland cement mortar bond coat: Laticrete "TriLite," MAPEI "Keraflex Super," or equal by Pro Spec, conforming to ANSI A118.4, ISO 13007- C2ES1P1, and TCA Detail W-245.

I. Floor Tile and Stone Saddle - Mud Set: Set floor tile and stone saddle using Portland Cement mortar setting bed conforming to ANSI A108.1A and latex modified Portland cement bond coat. Basis of Design: Laticrete "254 Platinum" or MAPEI "Keraflex Super," conforming to ANSI A118.4, ISO 13007-C2ES1P1, and TCA Detail F-112.

1. For installation of LFT: Improved Modified Cement Mortars and medium bed; Basis of Design: Laticrete "Multi Max Lite," or MAPEI "Ultraflex LFT," conforming to ANSI 118.15, ISO 13007-C2ES1P1.

J. Floor Tile and Stone Saddle - Thin Set over Waterproof Setting Bed: Set floor tile and stone saddle using thin set latex Portland cement bond coat. Basis of Design: Laticrete "254 Platinum" or MAPEI "Keraflex Super" conforming to ANSI A118.4, ISO 13007-C2ES2P1, and waterproofing membrane conforming to TCA Detail F-122/122A.

1. For installation of LFT: Improved Modified Cement Mortars and medium bed; Basis of Design: Laticrete "Multi Max Lite," or MAPEI "Ultraflex LFT," conforming to ANSI 118.15, ISO 13007-C2ES1P1.

K. Waterproofing Membrane: Complying with ANSI A118.10 and ANSI A118.12; and having IAPMO certification as a shower pan liner; provide "Hydro Ban" made by Laticrete International, "Mapelastic AquaDefense" by MAPEI with factory blended "Bio-Block Antimicrobial," ProSpec "B6000," or approved equal.

1. Reinforce membrane with polyester fabric where recommended by manufacturer.

2. Showers: B-415; run waterproofing up full height of walls.

L. Water: Clean, fresh, and suitable for drinking.

M. Grout: Complying with A118.7; and ISO 13007, CG2WAF; for grouting ceramic tile, provide a commercial Portland cement grout, Laticrete "PermaColor" or "PermaColor Select," "Ultracolor Plus FA" (additive not required) made by MAPEI, or comparable product by Custom Building Products or approved equal; color as selected by the Architect.

N. Physical Properties: The setting beds and grouts must meet the following physical requirements:

1. Compressive Strength: 3000 psi min.

2. Shear Bond Strength: 500 psi min.

3. Water Absorption: 4.0% max.

4. Service Rating (ASTM C 627): Extra Heavy Duty.

O. Sealer: Seal all grout joints and all unglazed tile using "StoneTech Heavy Duty Sealer" by Laticrete, "Sealer's Choice 15 Gold" by Aqua Mix Inc. or "Ultracare Penetrating Plus Stone, Tile, and Grout Sealer" by MAPEI.

P. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer's factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.

2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

Q. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, equal to "StoneTech Stone & Tile Cleaner" by Laticrete, "Concentrated Stone & Tile Cleaner" Aqua-Mix, "Ultracare Concentrated Tile & Grout Cleaner" by MAPEI, or approved equal, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.6 SEALANT

A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.

B. Bond Breaker: Polyethylene tape, 3 mils thick, or other material recommended by sealant manufacturer.

C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.

D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Architect. Sealant shall be equivalent to 1700 Sanitary Sealant made by General Electric or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where ceramic tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels in Floors: + 1/8" in 10'-0" distance and 1/4" total max. variation from levels shown.

B. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

C. Concrete substrates must meet ANSI A108.01 tolerances and surface textures in preparation for tile work. Coordinate with concrete trades.

3.3 PREPARATION

A. Coordinate the following with Section 033000:

1. Steel trowel and fine broom finish concrete slabs that are to receive ceramic tile. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation.

2. Tile floors with floor drains must have a slope to direction of 1/4" per foot; coordinate this with concrete trades.

B. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of setting bed. Rinse with water to remove all traces of treatment.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

D. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.4 JOINTS IN TILE WORK

A. Joint Widths: 1/16" wide in ceramic tile.

B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Architect.

C. Movement Joints: Conform to TCA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.

1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

3.5 INSTALLATION

A. Comply with the following installation standards:

1. Wall tile over cement board or glass mat backer board using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES1P1.

2. Wall tile over masonry or concrete using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES1P1.

3. Floor tile using full mud set mortar - ANSI A118.4, A228.15, and ISO 13007, C2ES1P1.

4. Floor tile using dry set mortar with latex additive - ANSI A118.4, A118.15, and ISO 13007, C2ES1P1.

5. Floor tile over waterproofing membrane - A118.15, and ISO 13007, C2ES1P1.

B. Backs of tile must be cleaned before installation.

C. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.

D. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes, and alignment shown.

1. Floors: 1/8" in 10'-0" run, any direction; +/- 1/8" at any location; 1/32" offset at any location.

2. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".

3. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.

E. Waterproofing Membrane

1. Install the membrane in strict accordance with manufacturer's written recommendations.

2. Upon completion of work, test horizontal membrane for leaks by flood testing per ASTM D 5957. Inspect for leakage. Make necessary adjustments to stop all leakage and retest until watertight. If membrane is not immediately covered by another surface, provide protection until membrane is covered.

F. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.

G. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.

H. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.

I. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.6 INSTALLATION OF STONE SADDLES

A. Install stone saddles cut to profiles and sizes shown, accurately fitted to jambs, coped at stops, set in full bed of mortar herein specified, and with grouted edge joints as specified for floor tile.

3.7 CLEANING AND PROTECTION OF CERAMIC TILE

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings from tile surfaces.

E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

END OF SECTION 093013

SECTION 095113

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the acoustical panel ceilings as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Acoustical panel units.
2. Exposed "T" suspension system, including hangers and inserts.
3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.
4. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.
5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

A. Steel Decking - Section 053100.

B. Drywall ceilings - Section 092900.

C. Diffusers, grilles and related frames - Division 23.

D. Lighting fixtures - Division 26.

1.4 QUALITY ASSURANCE

A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor’s Association.

B. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

C. The work is subject to the following standards:

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

D. In addition to suspension system specified, provide seismic struts and seismic clips to meet seismic standards as required by prevailing Codes and Ordinances.

1.5 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:

1. Any deviations from Architect’s reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect’s ceiling layout due to dimensional restrictions or field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Samples and Product Literature: Submit the following samples and related manufacturer’s descriptive literature.

1. Twelve (12) inch long components of suspension systems, including moldings.

2. Acoustical units — full size.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.9 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

A. Acoustical Panel Ceilings

1. Surface Texture: Smooth Texture
2. Composition: Fiberglass
3. Color: White
4. Size:
   i. 24” x 24”, 24” x 48” (typical)
   ii. 6” x 42”, 6” x 48”, 6” x 96” (‘techzone’)
   iii. 12” x 48”
5. Edge Profile: Square Lay-in
6. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.90
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton: N/A, 26

8. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton: N/A, 180, 190
9. Flame Spread: ASTM E 1264; Class A
10. Light Reflectance (LR) White Panel: ASTM E 1477; 0.88
11. Dimensional Stability: HumiGuard Plus
12. Recycle Content: Up to 71% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
13. Basis of Design: OPTIMA Lay-in or OPTIMA Tegular, item number _____, as manufactured by Armstrong World Industries, Inc.

A. Provide 3/4" thick, 24" x 24" and 24" x 48" mineral fiber panels with factory-applied white finish as manufactured by Armstrong World Industries, or comparable product of USG Interiors, Inc., Rockwool Rockfon, or approved equal. Panels shall meet ASTM E 1264, Class A, with maximum UL flame spread of 25 and smoke developed of 50 per ASTM E 84.

1. Coordinate with Techzone system where shown on architectural drawings.

2.2 SUSPENSION SYSTEM

A. Provide exposed "T" steel suspension system with low sheen white baked enamel finish equal to "Prelude," 15/16" exposed tee 2-way grid system made by Armstrong World Industries, or equal made by USG Interiors, Inc. or Chicago Metallic Corp.

B. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

C. Provide min. 12 ga. galvanized wire hangers, soft annealed steel conforming to ASTM A 641, prestretched, Class 1 zinc coating, soft temper, size so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire.

D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

E. Suspension systems shall conform to ASTM C 635, intermediate duty.

F. Provide manufacturer’s standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where acoustical panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not

proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, with wire hangers supported only from building structural members. Locate hangers not more than 6" from each end and spaced 4'-0" along direct-hung runner, leveling to tolerance of 1/8" in 12'-0".

C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

E. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.

1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.

2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

F. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

G. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.

H. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.

I. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient tile flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Rubber base.

2. Accessories.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900.

B. Resilient Tile Flooring - Section 096519.

C. Carpet Tile - Section 096813.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient tile.

B. Samples: Submit six (6) inch long samples of base and strips.

1.6 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 JOB CONDITIONS

A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

PART 2 PRODUCTS

2.1 RUBBER BASE

A. Provide 4" high by 1/8" thick continuous vulcanized SBR rubber top set cove base with pre-formed internal and external corner pieces, color as scheduled on the drawings. For areas to receive carpet, provide flat base, no cove. Base shall conform to ASTM F 1861, Type TS, Group 1 (solid) as manufactured by Armstrong, or comparable product by Roppe, Tarkett/Johnsonite, or approved equal.

1. Color: Metal Gray – Armstrong.

2.2 ACCESSORIES

A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient base is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.3 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer.

END OF SECTION 096513

SECTION 096519

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient tile flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Vinyl composition tile.
2. Transition strips.
3. Accessories.

1.3 RELATED SECTIONS

A. Resilient Base and Accessories - Section 096513.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient tile.

B. Samples

1. Submit full-size sample tiles for each type and color required, representative of the expected range of color and pattern variation. Sample submittals will be reviewed for color, texture, and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
2. Submit six (6) inch long samples of transition strips.

C. Submit manufacturer’s warranty as noted herein.

1.6 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F. or more than 95 deg F., in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.

2. During installation.

3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F. or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.8 WARRANTY

A. Provide manufacturers 5-year limited warranty.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE (VCT)

A. Provide 12" x 12" x 1/8" thick vinyl composition tile conforming to ASTM F 1066, Class 2 (through-pattern), Type II, in colors as selected by the Architect, equal to "Standard Excelon Imperial Texture" made by Armstrong, or comparable product by Johnsonite Tarkett, or approved equal. Provide tile units with uniformly distributed color and pattern throughout the thickness of tile. Variations in shades and off-pattern matches between containers are not acceptable.

1. Color: “Soft Warm Gray” – Armstrong.

2.2 ACCESSORIES

A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated based on a RH of 90%.

B. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.

C. Leveling Compound: Novoplan 2 made by Mapei, Ardex K-15 or approved equal.

D. Edging Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color as selected by the Architect from manufacturer's standards.

E. Finish

1. Cleaner shall be equal to "Super Shine All" made by Hillyard Chemical Co., or approved equal.

2. Wax shall be equal to "Super Hil-Brite" made by Hillyard Chemical Co., or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient tile flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels (Floors): ± 1/8" in 10'-0" distance and 1/4" total maximum variation from levels shown.

B. Grind or fill concrete substrates as required to comply with allowable variation.

3.3 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.4 INSTALLATION

A. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.

B. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines. Extend tile units into toe spaces, door reveals, and into closet and similar openings.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking devices.

D. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

E. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped, or deformed tile is not acceptable.

F. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.

G. Lay tile with grain in all tile running in the same direction.

H. Place resilient edge strips tightly butted to tile and secure with adhesive. Provide edging strips at all unprotected edges of tile, unless otherwise shown.

3.5 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes from tile, using neutral type cleaners as recommended by the tile manufacturer. Protect installed flooring from damage by use of heavy Kraft paper or other covering.

B. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Apply two (2) coats of wax and buff using materials as specified herein.

END OF SECTION 096519

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 096723

EPOXY RESIN COMPOSITION FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 WORK INCLUDED

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the epoxy resin composition flooring and base as scheduled on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Product Requirements – Section 016000

B. Cast-in-Place Concrete - Section 033000.

C. Floor drains - Division 22.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical data application instructions and general recommendations for the epoxy resin composition flooring specified herein.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.

1. Submit 3" x 3" samples of color chips from color chart selection designated by the Architect.

D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.

E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of substrate temperature, moisture, ventilation, and other conditions required to execute and protect Work.

B. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

PART 2 PRODUCTS

2.1 MATERIALS

A. Troweled epoxy resin composition flooring shall be Dex-O-Tex Cheminert "K" with Posi-Tred "O" top finish as manufactured by Crossfield Products Corp.; Compton, CA; Roselle Park, NJ; Hinsdale, IL; Moss Point, MS; or Sherwin Williams (G-P) TPM #115-U4 Upgraded Trowelled Mortar System, or approved equal.

2.2 PROPERTIES

A. Colors: As indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

B. Physical Properties: Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

1. Compressive Strength (ASTM C 579): 11,000 psi.

2. Tensile Strength (ASTM C 307): 1643 psi.

3. Flexural Strength (ASTM C 580): 4,300 psi.

4. Flexural Modulus of Elasticity (ASTM C 580): 2.0×10^6 psi.

5. Water Absorption (MIL D-3134): 0.3 percent max.

6. Surface Hardness (ASTM D-2240): 85.5 Durometer "D".

7. Abrasion Resistance (ASTM D-1044): 0.0 gr.

8. Indentation (MIL-D-3134): 0.024" max.

9. Impact Resistance (Gardner Impact Tester): No chipping, cracking, or delamination and not more than 0.014".

10. Adhesion (A.C.I. Comm. No. 403): 400 psi.

11. Electrical Conductivity (NFPA 56A): Di-electric.

12. Critical Radiant Flux (ASTM E-648): Greater than 1.07 watts/cm^2.

13. Co-efficient of Friction - Rubber Shoe Surface (MIL-D-3134 Test Procedure)

Profiles	Static Friction	Static Friction Oil	Sliding Friction	Sliding Friction Oil

	Saltwater Solution on Surface	on Surface	Saltwater Solution on Surface	on Surface
Fine Profile	0.95	0.75	0.89	0.44
Medium Profile	1.03	0.75	0.95	0.45
Coarse Profile	1.09	0.85	1.00	0.56
Very Coarse Profile	1.24	0.78	1.04	0.59

2.3 SUPPLEMENTAL MATERIALS

A. Joint Sealant: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and joint condition indicated.

B. Waterproofing Membrane: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and floor condition indicated.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the epoxy resin composition flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

B. Coordinate work with other trades to insure that concrete substrate has been "wet" cured only.

3.2 PREPARATION

A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

B. Concrete Surfaces: Shot-blast, acid etch, or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

C. Materials: Mix resin and hardener, add colorant and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

3.3 APPLICATION

A. General: Apply each component of epoxy resin composition flooring system according to manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated.

B. Bond Coat: Apply bond coat over prepared substrate at manufacturer's recommended spreading rate. Coordinate applying bond coat with topping mix to ensure optimum adhesion between flooring materials and substrate.

C. Body Coat: Over freshly applied primer, trowel apply epoxy mortar mix at 1/4-inch thickness. Hand or power trowel and grout with epoxy to fill voids. When cured, sand, if necessary, to remove trowel marks and roughness.

D. Finish or Sealing Coats: After body coat has cured sufficiently, apply finish or sealing coats of type recommended by flooring manufacturer to produce finish matching approved sample and in number of coats and spreading rates recommended by manufacturer.

1. Final finish coat shall be in color and skid retardant profile as approved by the Architect.

2. Finish floor shall be 1/4" thick, uniform in color and free of travel marks.

E. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Round interior and external corners. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

F. Joints: Where substrate is interrupted by expansion or control joints, provide joint in flooring to comply with details indicated or, if not otherwise indicated, as recommended by flooring manufacturer.

1. Apply joint sealant materials to comply with resinous flooring manufacturer's recommendations.

3.4 CURING, PROTECTION AND CLEANING

A. Cure epoxy resin composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

B. Protect epoxy resin composition flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and application method.

C. Cleaning: Remove temporary covering and clean epoxy resin composition flooring just before final inspections. Use cleaning materials and procedures recommended by flooring manufacturer.

END OF SECTION 096723

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 096813

CARPET TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor materials, equipment and services necessary to complete the carpet tile as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Carpet tile.

2. Adhesive.

1.3 RELATED SECTIONS

A. Concrete sub-floor – Section 033000.

B. Access Flooring – Section 096900.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than five (5) years of experience in installation of commercial carpeting of type, quantity, and installation methods similar to work of this Section.

B. General Terminology/ Information Standard: Refer to current edition of "Carpet Specifier's Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.

C. Carpet used on Project must be from same dye lot for each carpet type.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's complete technical product data for each type of carpet, cushion and accessory item required.

B. Samples: Submit full size samples of carpet tile and six (6) inches long samples of each type exposed edge stripping.

C. Certification: Submit manufacturer's certification stating that carpet materials furnished comply with specified requirements.

1. Include listing of mill register numbers for carpet furnished.

2. Include supporting certified laboratory test data indicating that carpet meets or exceeds specified test requirements.

D. Maintenance Data: Submit manufacturer's printed maintenance recommendations, including methods and frequency recommended for maintaining carpet in optimum conditions under anticipated traffic and use conditions.

1.6 EXTRA STOCK

A. Produce and deliver to project at least five (5) percent overrun on calculated yardage. Provide required overrun exclusive of carpet needed for proper installation, waste and usable scraps.

1.7 PRODUCT DELIVERY AND STORAGE

A. Deliver carpeting materials in original mill protective wrapping with mill register numbers and tags attached. Store inside, in well ventilated area, protected from weather, moisture and soiling.

1.8 WARRANTY

A. Provide special project warranty, signed by Contractor and Manufacturer (Carpet Mill), agreeing to repair or replace defective materials and workmanship of carpeting work during two (2) year warranty period following substantial completion. Attach copies of product warranty.

PART 2 PRODUCTS

2.1 CARPET TILE

A. Provide carpet tile of design and color scheduled on the drawings.

B. Provide anti-static (ESD) carpet tile where indicated.

2.2 ACCESSORIES

A. Adhesive for Carpet Tile: Provide release type adhesive as recommended by the carpet tile manufacturer for use with carpet tile specified. Provide adhesive which complies with flame spread rating required for the carpet installation.

B. Miscellaneous Materials: Provide the types of adhesives and tape, and other accessory items recommended by the carpet manufacturer and Installer for the conditions of installation and use.

C. Leveling Compound: Latex/Portland cement flash patching and leveling compound equal to No. DSP-520 made by H.B. Fuller or No. 226 with 3701 admixture made by Laticrete or equal made by Mapei, or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpet tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PRE-INSTALLATION REQUIREMENTS

A. Floor shall be clean and free of cracks and protrusions. Any gaps or cracks more than 1/16" wide to be filled in with latex leveling compound. Protrusions must be sanded down smooth, the floor cleanly swept and vacuumed if necessary to remove all dust and grit.

B. Floor temperature shall be 65 deg., at least 24 hrs. prior to installation; and 48 hrs. after carpet is installed.

C. Conduct a moisture test. The presence of moisture in the concrete floor will interfere with the curing and subsequent performance of the adhesive. Conduct the test as follows:

1. Drive a concrete nail a half inch into the floor. Then remove the nail.

2. Place a small amount of anhydrous calcium chloride or calcium sulphate crystals over the hole.

3. Cover the crystals and the hole with a piece of flat glass and seal the edges with waterproof tape or putty. Since concrete pourings vary, repeat the test every 1500 sq. ft.

4. Leave in place 72 hrs. Any color change in the crystals indicates the presence of moisture. Do not apply carpet until slab is free of moisture and meets with approval of carpet adhesive manufacturer.

D. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer’s instructions and recommendations. Maintain direction of pattern and texture, including lay of pile.

B. Adhere all tiles with a full spread of adhesive. Dry-fit cut tiles and apply adhesive to tile back after tile has been cut.

C. Tiles shall be installed in a monolithic corner to corner manner following arrows printed on back of each tile indicating pile direction. Tiles shall be installed to achieve patterns as directed by the Architect.

D. Follow manufacturer's complete written instructions for preparation and installation on access flooring substrates.

E. Vinyl reducer strips shall be used along any necessary open edges so as to maintain the fixed perimeter.

3.4 CLEANING UP

A. Upon completion of the carpeting installation in each area, visually inspect all carpet installed in that area and immediately remove all dirt, soil, and foreign substance from the exposed face; inspect all adjacent surfaces and remove all marks and stains caused by the carpet installation: remove all packaging materials, carpet scraps, and other debris from the carpet installation to the area of the job site set aside for its storage.

3.5 PROTECTION

A. In all areas, provide a temporary non-staining paper pathway in the direction of traffic.

END OF SECTION 096813

SECTION 096900

ACCESS FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the stringer-type access floor system as indicated on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Sealer for concrete floors below access floor - Section 033000.

B. Carpet Tile – Section 096813.

C. Connection to ground of access floor understructure - Division 23.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Firm approved by access flooring manufacturer and that has successfully installed access flooring systems of a scope similar to that of this project.

B. NFPA Standard: Provide access flooring which, when installed, complies with requirements of NFPA No. 75 for raised floors.

1.5 ENVIRONMENTAL CONDITIONS FOR STORAGE AND INSTALLATION

A. Prior to and during installation, a secure and dry storage space closed to the weather must be available for the access floor materials, with environment at 40° F to 90° F and approximately 35% to 70% relative humidity, 24 hours a day during and after installation.

B. The subfloor surface must be free of moisture, dust, dirt and other debris. Once installed, the access floor must be maintained in the same manner.

1.6 DESIGN PERFORMANCE AND CERTIFICATION OF PRODUCT

A. Provide access flooring system consisting of moveable assemblies composed of modular floor panels supported on pedestals forming accessible under floor cavities to accommodate electrical, mechanical, and HVAC services and complying with performance requirements specified. Raised floor panels must be interchangeable with each other except where cut for special conditions.

B. Load testing shall be performed according to "Recommended Test Procedures for Access Flooring" as established by the Ceiling and Interior Systems Construction Association (CISCA). These procedures shall be used as a guideline when presenting load performance product information.

C. Product test shall be witnessed and certified by an accredited independent engineering and testing laboratory based in the U.S.A. with a minimum of five (5) years' experience testing access floor components in accordance with CISCA test methods.

1.7 SUBMITTALS

A. Samples: Submit a sample of the floor panel and each understructure component.

B. Shop Drawings:

1. Submit drawings showing raised floor panel layout including starting point of installation.

2. Include details of component panels and pedestals. If required, show edge details of ramps, steps, handrails, and anchoring of pedestal bases to subfloor.

C. Certificates

1. Submit independent testing organization certificates indicating compliance with specified design criteria when tested and reported according to CISCA "Recommended Test Procedures for Access Floors."

2. Submit seismic calculations in accordance with prevailing building code. Calculations shall be performed using a current seismic program and prepared by a structural engineer licensed in the state where the project is located. The structural engineer shall sign and seal these calculations confirming that these calculations meet all local and state codes for seismic pedestal assemblies. A signed copy of these calculations must be given to the Architect.

1.8 TOLERANCES

A. Manufacturing Tolerance

1. Nominal Panel Size: ± 0.015" or less.

2. Panel Flatness: ± 0.020" or less.

3. Panel Squareness: ± 0.015" or less.

4. Panel Interchangeability: All panels, except those modified to meet special conditions, shall be interchangeable.

B. Installation Tolerance: Finished installation shall be level within ± 0.060" in 10 feet and ± 0.100" for the entire floor.

1.9 PROJECT CONDITIONS

A. The Contractor shall provide a clean, level, dry subfloor, temperature controlled, and protected from the weather.

B. Access flooring storage and installation areas shall be maintained at a temperature between 40° F to 90° F and between 35% and 70% relative humidity for 24 hours a day before, during and after installation.

C. Overhead construction work must be completed before installing access floor to avoid damage to panels and finishes.

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Manufacturers

1. Haworth, Inc.

2. Tate Access Floors, Inc.

3. Substitutions that meet or exceed design criteria

B. Floor Panels: Haworth TecCrete 1250 Panels shall be integrated steel pan construction with exposed top surface of lightweight concrete fill, bare corner lock.

Or

C. Floor Panels: Tate ConCore 1250 shall be welded steel construction with light weight cement fill and exposed top surface of painted steel, bare corner lock.

1. Panels shall be nominal 24" square x 1-1/8" deep, manufactured with hot-dip galvanized steel pan having shear tabs that integrally bond to the lightweight, high-strength concrete fill (Haworth) or nominal 24" square x 1-1/4" deep, manufactured with epoxy painted top sheet and bottom pan and lightweight cement fill (Tate). Panel corners shall be manufactured to receive the pedestal head positioning dome and containing a corner-lock/grounding insert. Each panel shall accept a flush-fit metal fastener which securely fastens each panel corner to the pedestal head.

2. Panel Finish: Floor panel surface shall be factory standard bare concrete (Haworth) or painted steel surface (Tate) for field installed finishes. Panels shall have a maximum electrical resistance of 10 ohms or less from the top edge of the panel, less surface covering, to the understructure.

3. Concentrated Load: A minimum of 1,250 lb. on one square inch at any location with a top surface deflection not to exceed 0.10", and a permanent set not to exceed 0.010".

4. Uniform Load: 440 lb, per square foot (Haworth) or 300 lb (Tate), with a maximum top surface deflection of 0.040" and a permanent set of 0.010".

5. Rolling Load: Panels shall withstand a rolling load of 1,200 lbs. (Haworth) or 1,000 lbs. (Tate) applied through a 3" dia. x 1-13/16" wide caster for 10 cycles over the same path with a maximum of 0.020" top surface permanent set. Panels shall withstand a rolling load of 800 lb. applied through a hard rubber-surfaced

wheel 6" dia. x 2" wide for 10,000 cycles over the same path with a maximum of 0.040" top surface permanent set.

6. Impact Load: A 150 lb. load dropped from 36'-0" onto a one inch square indenter shall not cause a system failure.

7. Heat Transmission: Bottom surface temperature exposed to 1,600 degrees F for 15 minutes shall not increase access floor surface temperature more that 150 degrees above the ambient temperature.

8. ASTM E 84: Class 1: Flame spread of 5 or less and smoke developed of 10 or less per NFPA.

D. Air Supply Panels

1. Provide and/or install passive or other floor diffusers with factory cutouts as indicated on drawings.

2. For under floor air applications, provide air-strip gaskets for exposed finished panels, or high pressure air highways, as indicated.

E. Understructure

1. Pedestal assemblies shall be of hot-dip galvanized steel.

2. The base shall be a minimum of 16 square inches and shall be stamped and/or embossed on its underside and shall be adhered to the sub floor with an adhesive recommended by the access flooring manufacturer.

3. Where mechanical anchors are required for seismic zones, provide same as required by project specific seismic calculations.

4. The threaded stud shall be 3/4" diameter steel.

5. The head assembly shall be designed so that the panels will be held in place with or without corner-lock fasteners.

6. Pedestal assembly shall provide an adjustment range of +/- 1" when finished floor height is 6" or more, adjustable at 1/64" increments.

7. The assembly shall provide a mechanical means to lock the floor in a level plane and adjustments shall be capable of being made without special tools.

8. For corner-lock system, the head of the all-steel assembly shall be designed to accept a metal fastener to mechanically lock the panels in place.

9. Pedestal assembly shall support not less than 6,000 lb. axial load and shall resist an average 1,000 inch-pound overturning moment when bonded to a clean concrete slab.

F. Accessories: Furnish ramps, steps, lateral bracing, fascia, handrails, cutouts and miscellaneous items where indicated and as required for complete installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the subfloor which is to receive access flooring for dryness, cleanliness, unevenness, or any irregularities that will affect the quality of the access flooring.

1. Verify that material storage and installation areas are at recommended temperature and relative humidity before, during, and after installation.

2. Verify that substrate is level to within 1/8" in 10 feet.

B. Do not commence installation of access flooring until subfloor is clean and dry, temperature controlled, and protected from the weather.

3.2 INSTALLATION

A. Pedestal locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with pedestal locations.

B. Installer is to coordinate with other trades to maintain the integrity of the installed access flooring. All traffic on access floor shall be controlled by the Installer only. No traffic other than the access floor installation crew shall be permitted on any floor area for 48 hours to allow the pedestal adhesive to set. Access floor panels shall not be removed by other trades for 72 hours after their installation.

C. Floor system and accessories shall be installed by an authorized factory trained installation company with a minimum of five (5) years' experience.

D. No dust or debris producing operations by other trades shall be allowed in areas where access floor is being installed to ensure proper bonding of pedestals to subfloor.

E. Installer shall keep the subfloor broom clean as installation progresses.

F. Install floor diffusers as indicated on Mechanical Drawings.

G. Finished installation shall be level within +/- 0.060" in 10 feet (3m) and +/- 0.100" for the entire floor area.

H. Replace damaged materials prior to the application of field-applied surfaces.

3.3 FIELD QUALITY CONTROL

A. Take random panel from shipment received at construction site and test panel for compliance with stated load criteria.

END OF SECTION 096900

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 098413

ACOUSTIC WALL PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the acoustic wall panels as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. 2" thick acoustical absorption panels wrapped in selected fabric.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000.

B. Gypsum wallboard - Section 092900.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualification: At least 5 years' experience fabricating and installing comparable work, employing skilled mechanics under competent supervision for all phases of the Work.

1.5 SUBMITTALS

A. Shop Drawings/Product Data

1. Base drawings on field measurements.

2. Show dimensioned wall elevations with seam and joint locations, cutout sizes and locations, anchor locations, relation to adjacent work; large scale joint and mounting details; materials type, weight/thickness, design, color; and other data necessary to fabricate and install work and coordinate work with affected trades.

B. Samples: Two 12" x 12" (minimum) panels in selected finish, showing seam, edge and cutout conditions.

C. Certification

1. Acoustical Performance: Certified reports of acoustical performance tests conducted and/or witnessed by a recognized, independent, testing agency. Tests shall have been done by specified methods or recognized equivalent. Sound absorption tests shall be not more than three years old. Reports on earlier tests are acceptable if it can be established to the Architect's satisfaction, that they are valid indications of compliance with Project requirements.

2. Fire Hazard: Evidence of compliance with regulatory agency and specifications requirements.

D. Cleaning and Maintenance Instructions: Recommendations for Owner maintenance and cleaning per Section 017300 requirements. Identify cleaning/spotting products generically or by trade name.

E. Manufacturer Qualifications: List comparable installations with 3-year (minimum) service histories. Describe installations and give Owner/building manager names and addresses.

1.6 REFERENCES

A. ASTM C 423 Test for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E 84 Test for Surface Burning Characteristics of Building Materials.

1.7 DELIVERY, STORAGE AND HANDLING

A. Allow materials to become acclimated to Project conditions before installation, if necessary to prevent sag and distortion during service life.

1.8 PROJECT CONDITIONS

A. Environmental Conditions

1. Work areas shall be at or near ambient occupancy temperature and relative humidity.

2. Painting, dust-raising activities, and work that introduces dampness shall be completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide products manufactured by one of the following:

1. Armstrong World Industries.

2. DFB Sales Inc.

3. Fabritrak Systems Inc.

4. StretchWall Products Inc.

2.2 GENERAL

A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sages, blisters, seams, adhesive or other foreign matter.

1. Fabricate back mounted panels in factory to exact sizes required to fit wall surfaces based on field measurements of completed substrates indicated to receive acoustical wall panels.

2. Where radius corners are indicated, attach facing material so there are no seams or gathering of material.

B. Dimensional Tolerances of Finished Units: Overall height and width of panels - plus or minus 1/16".

C. Sound Absorption Performance: Provide acoustical wall panels with minimum noise reduction coefficients (NRC) indicated, as determined by testing per ASTM C 423 for mounting type specified under individual product requirements.

D. Colors, Textures, and Patterns: Where manufacturer's standard material is indicated, provide acoustical wall panels faced with manufacturer's material complying with the following requirements:

1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.

2.3 BACK MOUNTED ACOUSTICAL WALL PANELS

A. Back Mounted, Edge Reinforced Acoustical Wall Panels: Manufacturer's standard panel construction consisting of facing material laminated to front, edges, and back border of molded glass fiber board core; with edges chemically hardened to reinforce panel perimeter against warpage and damaged; and complying with the following requirements:

1. Core Density: 6 - 7 lb./cu. ft.

2. Thickness and NRC: Nominal overall panel thickness of 2" and NRC of not less than 0.95 for Type A (ABPMA No. 4) mounting.

3. Facing Material: Manufacturer's standard abuse resistant woven polyester fabric over glass fiber scrim.

4. Panel Size: As indicated.

5. Edge Detail: Square.

2.4 ACCESSORIES

A. Back Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels of type and size indicated to substrates provided, and complying with the following requirements:

1. Mechanically Mounted Edge Reinforced Panels: Metal panel clip and base support bracket system consisting of 2 part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to support panels laterally; and base support brackets designed to support full weight of panels; with both designed to allow panel removal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where acoustic wall panels are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General

1. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's printed instructions for installation of panels using type of mounting accessories indicated or, if none indicated, as recommended by manufacturer.

2. Construction Tolerances

a. Variation from Plumb and Level: +/- 1/16".
b. Variation of Joints from Hairline: Not more than 1/16".

B. Anchoring to Drywall: Anchor clips to unreinforced gypsum board with toggle or Molly anchors. Anchor clips to metal drywall framing with tapping sheet metal screws.

C. Panels shall be pressed against wall and slid down engaging "Z" clips into wall brackets.

D. Remove and replace panels that are damaged and are unacceptable to Architect.

3.3 ADJUSTING AND CLEANING

A. Correct non-complying and damaged/defective Work. Replace work that cannot be satisfactorily repaired.

B. Restretch and reinstall sagging and distorted fabric and correct other defects that occurred during normal service.

C. Carefully and thoroughly clean completed work by vacuuming and/or other means. Remove soil, stains, loose threads.

D. Protect work from soiling and other damage.

END OF SECTION 098413

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Prime painting unprimed surfaces to be painted under this Section.
2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged, or rusted prime coats applied by others.
3. Painting all ferrous metal (except stainless steel) exposed to view.
4. Painting all galvanized ferrous metals exposed to view.
5. Painting interior concrete block exposed to view.
6. Painting gypsum drywall exposed to view.
7. Painting concrete floors.
8. Sealing concrete floors.
9. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
10. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
11. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
13. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

1. Plumbing - Division 22.

2. Heating, Ventilation and Air Conditioning - Division 23.

C. Color Coding of Mechanical Piping and Electrical Conduits – Divisions 22 and 26.

1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.

B. Factory-finished toilet partitions.

C. Factory-finished acoustical tile.

D. Non-ferrous metals, except for items specified and/or indicated to be painted.

E. Finished hardware, except for hardware that is factory primed.

F. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

A. Job Mock-Up

1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.

2. These applications when approved will establish the quality and workmanship for the work of this Section.

3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.

C. Paint Coordination: Provide finish coats that are compatible with the prime coat paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

A. Materials List: Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.

B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.

2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

D. Closeout Submittal

1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Section 2.4). These companies are Benjamin Moore, PPG Paint (Glidden Professional), and Sherwin Williams (S-W). Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat-Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.

B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.

F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

A. High Performance Coating on Exterior Galvanized Ferrous Metals

First Coat:	"PittGuard Rapid Coat Epoxy 95-245 Series by PPG, "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Recoatable Epoxy Primer 867-45" by Sherwin Williams.
Second Coat:	"Pittthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1080 (gloss) Endura-Shield WB" or "Series 1081 (semi-gloss) Endura-Shield WB" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510 (Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Urethane B65-300/350" by Sherwin Williams.

B. High Performance Coating on Exterior Non-Galvanized Ferrous Metals

Prime Coat:	"Amercoat 68HS Epoxy Zinc-Rich Primer" by PPG; "Series 94-H_2O Hydro-Zinc" by Tnemec; "Organic Zinc Rich Primer V 170" by Benjamin Moore Corotech or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.
Second Coat:	"Pitt Guard Rapid Coat Epoxy 95-245" by PPG; "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Macropoxy 646 Fast Cure Epoxy B58-600" by Sherwin Williams.
Third Coat:	"Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1070V (gloss) Fluoronar" or "Series 1071V (semi-gloss) Fluoronar" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510 (Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

C. Interior Ferrous Metal

Satin Finish/Latex

Primer:	Benj. Moore Ultra Spec HP Acrylic Metal Primer (HP04) PPG Pitt Tech Plus DTM Acrylic Primer 4020 Sherwin-Williams Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
First Coat:	Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25) PPG Pitt Glaze WB1 Pre-Catalyzed Eggshell Epoxy 16-310 S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series
Second Coat:	Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25) PPG Pitt Glaze WB1 Pre-Catalyzed Eggshell Epoxy 16-310 S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series a. Total DFT not less than: 3.9 mils

Semi-Gloss Finish/Latex

Primer:	Benj. Moore Ultra Spec-HP Acrylic Metal Primer (HP04) PPG Devflex 4020 PF DTM Primer/Flat Finish Sherwin-Williams Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
First Coat:	Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29) PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510 S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
Second Coat:	Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29) PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510 S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series a. Total DFT not less than: 4.0 mils

D. Interior Concrete Block

Flat Finish/Vinyl Acrylic Latex over Filler

Block Filler:	Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571) PPG Speedhide HI Fill Latex Block Filler 6-15XI S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat:	Benj. Moore Ultra Spec 500 Interior Flat Latex (N536) PPG Speedhide Zero Interior Latex Flat 6-4110XI

S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Flat Latex (N536)
PPG Speedhide Zero Interior Latex Flat 6-4110XI
S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
a. Total DFT not less than: 10.7 mils

Eggshell Finish/Vinyl Acrylic Latex Over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PPG Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eggshell, B20-1900 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eggshell, B20-1900 Series
a. Total DFT not less than: 10.9 mils

Semi-Gloss Finish/Vinyl Acrylic Latex over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PPG Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Interior Latex Gloss (N540)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI Series
S-W ProMar 200 Zero VOC Interior Latex S. Gloss, B31-2600 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Latex Gloss (N540)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI Series
S-W ProMar 200 Zero VOC Interior Latex S. Gloss, B31-2600 Series
a. Total DFT not less than: 10.7 mils

E. Interior Drywall

Flat Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PPG Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Moore Ultra Spec 500 Latex Flat (N536)
PPG Speedhide Zero Interior Latex Flat 6-4110XI
S-W ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Flat (N536)
PPG Speedhide Zero Interior Latex Flat 6-4110XI
S-W ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series
a. Total DFT not less than: 3.6 mils

Eggshell Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PPG Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shell, B20-1900 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI

S-W ProMar 200 Zero VOC Interior Latex Eg-Shell B20-1900 Series
a. Total DFT not less than: 3.8 mils

F. Interior Painted Wood

Satin Finish/Latex
Primer: Benj. Moore Advance Waterborne Int. Alkyd Primer (790)
PPG Seal Grip Interior Primer/Finish 17-951
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Advance Waterborne Int. Alkyd Satin (792)
PPG Speedhide Zero Interior Latex Satin, 6-4410XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
Second Coat: Benj. Moore Advance Waterborne Int. Alkyd Satin (792)
PPG Speedhide Zero Interior Latex Satin, 6-4410XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
a. Total DFT not less than: 4.0 mils

Semi-Gloss Finish/Latex
Primer: Benj. Moore Advance Waterborne Int. Alkyd Primer (790)
PPG Seal Grip Interior Primer/Finish 17-951
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Advance Waterborne Int. Alkyd (793)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
Second Coat: Benj. Moore Advance Waterborne Int. Alkyd (793)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
a. Total DFT not less than: 3.8 mils

G. Concrete Floor Paint

Primer: Corotech V155 Solid Epoxy Pre-Primer
First Coat: Corotech V440 Waterborne Amine Epoxy
Second Coat: Corotech V440 Waterborne Amine Epoxy
Non-Slip Aggregate: Broadcast Corotech V630 Anti-Slip Aggregate

H. Concrete Floor Sealer: "Super Diamond VOX" water-based, low-VOC acrylic sealer, as manufactured by Euclid Chemical Company, or approved equal.

2.5 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.

B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.

C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.

D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.

E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.

F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.

G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.

H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.

B. The Contractor shall furnish the Architect a schedule showing when it is expected that the respective coats of paint for the various areas and surfaces will have been completed. This schedule shall be kept current as the job progresses.

C. The Contractor shall protect his work at all times and shall protect all adjacent work and materials by suitable covering or other method during progress of painting and finishing work. Upon completion of the work, Contractor shall remove all paint and varnish spots from floors, glass and other surfaces, and shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others, and leave all painting and finishing work in clean, orderly, and acceptable condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

I. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

A. General

1. The Contractor shall be held entirely responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be completely dry, clean and smooth.

2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer’s instructions and as herein specified, for each particular substrate condition.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.

2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.

a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to insure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.

4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

C. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."

D. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

E. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt, mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

F. Testing for Moisture Content: Contractor shall test all masonry and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

G. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer’s directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat; provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General

1. Apply paint by brush or roller in accordance with the manufacturer’s directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine

use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 099000

THIS PAGE IS INTENTIONALLY LEFT BLANK

sandpaper or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

    a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.

7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. Touching-Up of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To touch up, the Contractor shall

SECTION 101400

SIGNAGE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the signage as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Room identification signs.
2. Interior directional and door signage.
3. Exterior Dimensional Letters,
4. Fire egress, floor, and other signs required by Code.

1.3 RELATED SECTIONS

A. Plaques - Section 101416.

B. Dimensional Letter Signage - Section 101419.

C. Exit signs - Division 26.

1.4 QUALITY ASSURANCE

A. For actual installation of the interior panel signs, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.

B. Samples: Submit samples of each sign showing finishes, colors, surface textures and qualities of manufacture and design of each sign component, including graphics.

C. Shop Drawings: Submit shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 PANEL SIGNS

A. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16" measured diagonally from corner to corner, manufactured from aluminum, unframed. Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, of letters, numbers, and other graphic devices.

C. Tactile Characters: Characters and Grade 2 Braille raised 1/32" above surfaces, in contrasting color.

D. Finishes: For exposed sign material that requires selection of materials with integral or applied colors, surface textures, or other characteristics related to appearance, provide colors and surface textures as selected by the Architect.

2.2 DIMENSIONAL LETTERS AND NUMBERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles. Character dimensions and thicknesses shall be as detailed on the drawings.

1. Character Material: _____, 0.250” thick.

2. Mounting: Projecting studs fabricated from same basic metal and finish of fastened metal unless otherwise indicated. Provide threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

3. Typeface: As indicated.

B. Fabrication

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding. Provide welds behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded connections of flux, and dress exposed and contact surfaces.

4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

5. Internally brace signs for stability and for securing fasteners.

6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where signage is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF PANEL SIGNS

A. Install units and components at the locations directed by the Architect, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Architect.

3.3 INSTALLATION OF DIMENSIONAL LETTERS

A. Install units and components at the locations directed by the Architect, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of dimensional letters to finish surfaces. Repair or replace damaged units as directed by the Architect.

C. Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Projected Mounting: Mount letters at the projection distance from the wall surface indicated.

2. Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

3. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.

END OF SECTION 101400

SECTION 101416

PLAQUES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the plaques as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Cast metal plaques.

1.3 RELATED SECTIONS

A. Signage - Section 101400.

B. Exit signs - Division 26.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Submit shop drawings for fabrication and installation details and attachments to other work. Show plaque mounting heights, locations of supplementary supports to be provided by other installers, and accessories. Show message list, typestyles, graphic elements, raised characters and Braille, and layout for each plaque.

C. Samples: Submit samples for each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Plaques and Exposed Accessories: Full-size sample of plaque and of each accessory type.

2. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

D. Maintenance Data: For plaques to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Deterioration of finishes beyond normal weathering.

2. Deterioration of embedded graphic image.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 CAST PLAQUES

A. General:

1. Provide cast plaques incorporating the Ulster County seal, including words and text.

2. Plaques shall be manufactured with high-quality materials and finishes, ensuring durability and resistance to weathering.

B. Casting shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for material, border style, background texture, and finish, and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish.

1. Plaque Material: Bronze, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.

2. Size: As indicated.

3. Thickness: 0.50 inch.

4. Finish: Selected by Architect.

5. Background Texture: Smooth.

6. Integrally Cast Border Style: Square single line, polished.

7. Mounting: Concealed studs.

8. Design and Artwork:

a. The design of the plaques, including text and graphics, shall be based on a high-resolution file of the Ulster County seal provided by the County. Acceptable file formats include EPS, TIFF, or JPEG.

b. Manufacturer shall verify the suitability of the provided graphic file for use in casting processes and notify the Architect of any adjustments required for optimal results.

c. A proof of the layout, including seal and text, shall be submitted for approval prior to fabrication.

C. Fabrication

1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where plaques are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Plaques: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.

2. Install plaques so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.

4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

5. Mounting - Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.

3.3 CLEANING AND PROTECTION

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or

components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 10 14 53

TRAFFIC SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. "New York State Stormwater Management Design Manual" January 2015 edition.

1.2 SECTION INCLUDES

A. This Section includes the following:

1. Traffic Control signs.

2. Stormwater Management Identification signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Sign Schedule: Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 WARRANTY

A. When warranties are required, verify with Owner's Representative that special warranties stated in this Article are not less than remedies available to Owner under prevailing local laws. Coordinate with Division 01 Section "Product Requirements."

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

C. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SIGNS

A. All signs shall conform to the latest edition of the New York State Department of Transportation (NYSDOT) Standard Specifications, Section 645 and the "National Manual of Uniform Traffic Control Devices" – 2023 Edition (MUTCD) and NYS Supplement.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

B. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner and Owner's Representative after completion of the Work.

END OF SECTION 101453

SECTION 101499

VINYL WALL GRAPHICS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the vinyl wall graphics as shown on the drawings and/or specified herein.

1.3 QUALITY ASSURANCE

A. For installation of vinyl wall graphics, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of vinyl wall graphics required.

B. Samples: Submit samples of each type of vinyl wall graphics showing finishes, colors, surface textures, qualities of manufacture and design.

C. Shop Drawings: Submit shop drawings for fabrication and erection of vinyl wall graphics. Include plans, elevations, and large-scale details of design layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.5 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 VINYL WALL GRAPHICS

A. Provide vinyl wall graphics as selected by Architect, in size, pattern and color as shown on drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where vinyl wall graphics are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install vinyl wall graphics on gypsum drywall substrate at the locations directed by the Architect. Attach to substrate in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of vinyl wall graphics to finish surfaces. Repair or replace damaged units as directed by the Architect.

END OF SECTION 101499

SECTION 102114

SOLID PHENOLIC FLOOR MOUNTED TOILET PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet partitions as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Floor-mounted, overhead-braced, solid phenolic toilet partitions.
2. Wall-hung urinal screens.
3. Hardware and accessories.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900.

B. Ceramic Tiling - Section 093013.

C. Toilet Accessories - Section 102813.

1.4 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to fabrication to ensure proper fitting of the work.

B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be built into other work for the installation of toilet partitions and related work. Coordinate delivery with other work to avoid delay.

1.5 SUBMITTALS

A. Shop Drawings: Before any of the materials of this Section are delivered to the job site, submit the following:

1. Room layouts and elevations for all areas, with dimensions based on actual dimensions taken at site.
2. Materials, finishes, details of construction, gauges of metal, hardware, fastening and anchoring conditions and relation to adjoining construction.

B. Samples - Submit:

1. Solid phenolic panel, each color - 12" x 12".

2. All hardware and fitting items and fastenings for same. Include all items listed under 2.2 C. below.

C. Templates: Submit templates to other trades as required for support of toilet partitions.

1.6 WARRANTY

A. Provide manufacturer’s written warranty covering all components against breakage, corrosion and delamination for a period of 15 years.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Solid Phenolic Toilet Compartments: Toilet compartment shall be floor-mounted, overhead-braced, solid phenolic assemblies with non-corrosive doors, panels, and pilasters, Global Partitions, Bobrick, or approved equal.

B. Urinal Screens: Provide wall hung urinal screens of same material as toilet partitions.

C. Doors: Shall be manufactured of solid phenolic core material 3/4" thick with high pressure matte finish melamine surfaces. Edges shall be black.

D. Panels shall be same construction as doors; 1/2" thick.

E. Pilasters: Shall be 1" thick solid phenolic core material. Same construction as doors and panels. Pilasters are to be anchored to floor with standard 3/8" threaded rod, hex nuts and washers to provide vertical adjustment and necessary strength.

F. Hardware: Surface Mounted Aluminum Slide Latch Coat Hook, Aluminum Wrap Around Hinge Assembly and Aluminum Door Stop & Keeper.

G. Fittings: Wall connection brackets for panels and pilasters to be stainless steel. Pilaster trim to be 3" high, 0.031 stainless steel. All hardware and fittings to be secured with vandal-proof sex bolts.

H. Fabrication: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

I. Finish per Architectural Drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where floor mounted toilet partitions are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install work of this Section in a rigid and permanent manner, straight and plumb, with all horizontal lines level.

B. Install panels and doors 14" above finished floor, unless otherwise indicated. Toilet compartment doors shall be centered on water closets, unless otherwise indicated.

C. Maintain uniform clearance of approx. 1/2" between pilasters and panels, and 1/2" between pilasters or panels and finished wall.

D. Maintain uniform clearance of 1/4" or less between vertical edges of doors and pilasters.

E. Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

END OF SECTION 102114

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 102213

WIRE MESH PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wire mesh partitions as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Concrete - Section 033000.

B. Masonry - Section 042000.

1.4 QUALITY ASSURANCE

A. Provide products of the standard best quality for the particular kind of material specified.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's latest published literature for approval. Obtain approval before materials are delivered to the job site.

B. Submit installation shop drawings for locations as indicated on the contract drawings. Shop drawings shall indicate elevations, sections, methods of anchoring and connecting to surrounding construction.

1.6 DELIVERY, STORAGE AND HANDLING

A. Avoid damage to items during transit and delivery. Do not set work damaged in transit; replace with undamaged material without additional cost to the Owner.

B. A space at the building shall be designated for the storage of material provided under this Section. The responsibility for all such material shall, however, rest entirely with the Contractor until it has been set and accepted as complete in accordance with the Contract requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wire Mesh Partitions

1. Mesh: 1-1/2" diamond-intermediate crimped.
2. Wire: No. 10 W & M gauge, 0.135 steel wire woven inot a 2 by 1 inch rectangular mesh.
3. Vertical Channel: 1-1/4" x 5/8" "C" Type with 1/4" bolts.
4. Horizontal Channel: 1" x 1/2".
5. Center Reinforcement: Double: Two 1" x 1/2" CCR channel bolted each side of mesh.
6. Corner Post: 1-3/4" x 1-3/4" x 1/8" angle.
7. Top Reinforcement: 2-1/4" x 1" Channel: Fastened with 1/4" "U" bolts. Approximately 24" on center.
8. Floor Sockets: 1-1/4" x 1-1/4" x 2-1/2" high-ductile iron (weldable).
9. Swinging Door Frame: 1-1/4" x 1/2" channel.
10. Hardware: Mortise type lock operated by key outside, recess knob inside.

B. Finish

1. Fabricated units shall be dipped in a cleaning bath.
2. Units shall be polyester powder coated and air dried.
3. Color shall be as selected by the Architect from manufacturer's standard colors.

C. Bracing: Free standing partitions shall have 3" channel line posts approximately 15'-0" on center with 9" x 18" x 5/16" base plates.

2.2 MANUFACTURER

A. Wire mesh partitions of height and layout as shown on the Drawings shall be:

1. WireCrafters Style 840 or manufacturer as listed below:
2. Miller Wire Works, Inc.
3. Acorn Wire and Iron Works, Inc.
4. The G/S Co.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where wire mesh partitions are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. All work is to be executed by skilled mechanics and shall be of the finest quality, neat in appearance and free from defects.

B. Installation shall be made in strict accordance with manufacturer's recommendations, plumb, and true to line and level. Anchor partitions firmly to floor and adjacent masonry walls.

3.3 ADJUST AND CLEAN

A. Clean and leave free from blemishes, defects and dirt.

B. Replace any damaged units at no change in Contract Price.

C. Adjust hardware for maximum efficiency.

END OF SECTION 102213

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 102226

OPERABLE PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the operable partitions as indicated on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Structural steel support - Section 051200.

B. Wood blocking - Section 062000.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of operable partition and installation accessory required.

1. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.

B. Shop Drawings: Submit shop drawings showing location and extent of operable partitions. Include plans, elevations, and large scale details of anchorages, and accessory items. Indicate location of each unit with building, conditions at openings, typical for special details, location and installation requirements for hardware and operators.

1. Include methods of installation for each type of support structure and fastening condition.

C. Template Drawings: Submit location template drawings for items supported or anchored by permanent construction.

D. Maintenance Data: Include complete Maintenance Manual.

E. Samples for Initial Selection Purposes: Manufacturer's standard color charts showing full range of colors and materials for each component exposed to view, available for each type of operable partition required.

F. Samples for Verification Purposes

1. 12" square samples of finish selected.

2. Prepare samples form same material to be used for the work.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm (material producer) with not less than three (3) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.

B. Installer Qualifications: Firm specializing in operable partition installation with not less than two (2) years of experience in installation of operable partitions similar to those required for this project.

C. Single Source Responsibility: Provide material produced by a single manufacturer partitions and mounting hardware.

D. Physical Properties: Provide operable partitions identical to those tested for the following physical properties, according to the test method indicated.

1. Sound Insulation

a. Rating: NIC of not less than 42, STC of not less than 51.
b. Test Method: ASTM E-336, ASTM C-423.

E. Certification: Submit manufacturer's certificate stating that materials furnished comply with specified requirements. Include supporting certified laboratory testing data indicating that material meets specified test requirements.

1.6 REFERENCED STANDARDS

A. ASTM C-423: Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E-84: Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E-90: Method for Laboratory of Airborne Sound Transmission Loss of Building Partitions.

D. ASTM E-557: Practices for Architectural Application and Installation of Operable Partitions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.8 SEQUENCING AND SCHEDULING

A. Sequence operable partition installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.9 WARRANTY

A. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period is two (2) years after the date of substantial completion.

1.10 MAINTENANCE

A. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performances.

PART 2 PRODUCTS

2.1 OPERABLE PARTITION SYSTEM

A. Operable wall shall be "Acoustiseal Encore" individually hinged, top supported, manually operable wall system as manufactured by Modernfold, or ‘Moduflex Model 610PP” system made by Panelfold, or equal by Kwik-Wall Co..

B. Panel construction shall be 4-1/4″ inches thick, of all steel construction. Panel skins shall be twenty-one (21) gauge steel assembled to a sixteen (16) gauge steel frame. Steel skins shall have laminated backing for rigidity. Top channel assembly shall be reinforced to support the suspension components. "Wrap-around" skin/panel construction shall not require vertical trim on panel faces and shall, with astragal seals, provide a minimum "groove" appearance at the vertical panel joints.

C. Panel shall be finished with Acoustical non-woven wall carpet meeting NFPA 286 Class A standards, as selected by the Architect from manufacturer's standard colors and manufacturer’s select fabric pattern. (Basis of Design: ‘Ribtex Sculptured - Trullo’ from Panelfold.) Edges of fabric shall be concealed.

D. Sound seals shall be as follows:

1. Vertical seals between panels shall consist of tongue and groove configuration, extruded aluminum astragals incorporating vinyl acoustical seals. Horizontal top seals shall be continuous contact extruded vinyl shape.

2. Automatic floor seals shall provide operable travel of 2.5" to accommodate +.5" - 1.5" of deflection and/or floor variation and shall automatically drop when each panel is pushed into place. Downward seal pressure shall assure an acoustical seal and resist panel movement. Exposed seal channel shall have a satin black finish.

3. Provide any additional seals required to achieve STC rating specified below.

E. Suspension system shall consist of a continuous C channel shape steel track – “#17 Track System” by ModernFold or equivalent by other approved manufacturer. . The track shall be supported by adjustable steel brackets, hangers, rods and nuts. Furnish template to steel fabricator for cutting of holes.

F. Panels shall be supported by trolley assemblies consisting of four (4) ball bearing steel wheels. Trolleys shall be attached to panels with minimum 3/4" diameter adjustable pendant bolts.

G. All operating hardware shall be brushed chrome. All hinges, astragals, and seal trim shall be satin black finish.

H. Laboratory acoustical performance of the operable wall shall have been tested in an independent acoustical laboratory in accordance with ASTM E90 Test Procedures, and shall have attained an STC Rating of no less than 52.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where operable partition is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install operable partitions and accessories after finishing operations, including painting, have been completed.

B. Install operable partitions in conformance with drawings, approved shop drawings and using method indicated in strict compliance with manufacturer's written installation instructions; complying as applicable with ANSI E-557, Standard Recommended Practice for Architectural Application and Installation of Operable Partitions.

C. Lubricate bearings and sliding parts; adjust to ensure smooth, easy operation.

D. Match operable partitions for color and pattern by using partitions from cartons in same sequences as manufactured and packaged, if so numbered. Broken, cracked, chipped, or deformed partitions are not acceptable.

3.3 FIELD TESTS

A. Owner will engage an independent testing service to provide in place tests of each operable partition for Noise Isolation Class (NIC). Tests for measurement of noise isolation between rooms will be performed in general conformance with ASTM E-336; NIC rating will be calculated in accordance with ASTM E-413.

B. If any operable partition does not initially meet NIC requirements stated in 1.5, D, installer will be responsible for modifying and adjusting partition assembly as required, after which partition will be retested until compliance is achieved.

1. Owner will pay cost of initial in place field test for each operable partition. Cost of additional testing will be borne by the Contractor.

3.4 CLEANING

A. Clean all operable partition surfaces and clean adjacent surfaces soiled by work of this Section. Avoid use of abrasive cleaners or solutions containing corrosive solvents.

B. Remove debris created by operable partition work from work site.

C. Protect partitions against damage during construction period. Ensure that partitions will be without damage or deterioration at time of substantial completion.

3.5 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's personnel.

END OF SECTION 102226

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 102600

WALL AND CORNER GUARDS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wall and corner guards as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Masonry – Section 042000.

B. Gypsum drywall – Section 092900

1.4 QUALITY ASSURANCE

A. Cover materials shall be classified in accordance with ASTM E 84 as to flame spread and smoke development and shall be classified as self-extinguishing in accordance with ASTM D 635.

1.5 SUBMITTALS

A. Samples: Two (2) samples of wall guards and corner guards each 12” long shall be delivered to the Architect.

B. Shop Drawings: Submit shop drawings for wall and corner guards showing all anchorage devices.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wall guards shall be surface mounted, Model SCR-40N, as manufactured by C/S Group., size as indicated on the drawing. Guards shall have a 0.078” thick continuous

extruded vinyl cover securely locked in place over the concealed retainer. Guards shall be provided with retainers having intermediate supports for the cover.

B. Corner guards shall be surface mounted, Model SSM-25N manufactured by C/S Group size as indicated on the drawings, with 0.078" thick continuous extruded vinyl cover.

C. Color of vinyl for wall and corner guards shall be as selected by the Architect.

D. Vinyl covers shall be rated Class "I" as to flame spread and smoke development.

E. Similar wall and corner guards as manufactured by Brown Manufacturing Co. or InPro. are acceptable.

F. Appropriate end caps, bolts, and other required fitting shall be provided.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where wall and corner guards are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Wall guards shall be installed by bolting with 1/4" toggle bolts through the retainer and the gypsum wallboard substrate. Bolts shall be 32" o.c. for wall guards and shall securely anchor wall guards. Corner guards shall be installed by self-tapping sheet metal screws through the retainer, the gypsum wallboard substrate and the metal wall stud. Screws shall be 20" o.c. for corner guards and shall securely anchor the corner guards.

B. Wall guards shall be set parallel to the floor at heights shown on the Drawings.

C. Corner guards shall be set in alignment with the corner bead of the gypsum wallboard substrate.

3.3 ADJUST AND CLEAN

A. Clean surfaces promptly after installation, exercise care to avoid damage to surfaces.

B. Protect wall and corner guards from damage until acceptance of work.

END OF SECTION 102600

SECTION 102813

TOILET ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet accessories as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Toilet paper dispensers.
2. Sanitary napkin disposal units.
3. Liquid soap dispensers.
4. Grab bars.
5. Diaper-changing stations.
6. Shelf and hook strip for Janitor’s Closets.
7. Power Towel Dispenser.
8. Waste Receptacles.
9. Coat Hooks.

1.3 RELATED SECTIONS

A. Unit Masonry - Section 042000.

B. Gypsum Drywall - Section 092900.

C. Ceramic Tiling - Section 093013.

D. Toilet Partitions - Section 102113.

E. Electrical - Division 26.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units. Accessories shall be installed at heights in compliance with prevailing Handicapped Code.

C. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, catalog cuts and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

C. Submit schedule of accessories indicating quantity and location of each item.

1.6 PRODUCT HANDLING

A. Deliver accessories to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type or material, manufacturer's name and brand name. Delivered materials shall be identical to approved samples.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 240 or ASTM A 666, Type 304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Galvanized Steel Sheet: ASTM A 653, G60.

D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

2.2 FASTENING DEVICES

A. Exposed Fasteners: Theft-proof type, chrome plated, or stainless steel; match finishes on which they are being used.

B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.

C. No exposed fastening devices permitted on exposed frames.

D. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where

locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.

C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Diaper-Changing Table: As manufactured by Koala Kare products, Division of Bobrick; recessed-mounted horizontal unit that opens by folding down from stored position and with child-protection strap. Diaper-changing table shall be engineered to support a minimum of 250 lb. static load when opened.

2.4 MANUFACTURERS

A. Provide products manufactured by Bobrick Washroom Equipment Co., American Specialties, Inc., Bradley Corp., A & J Washroom Accessories, or approved equal.

2.5 ACCESSORY SCHEDULE

A. Basis-of-Design products are from Bobrick Washroom Equipment, as follows:

KEY	DESCRIPTION	MODEL NO.
A1	WALL MIRROR	B-290 SERIES
A2	PAPER TOWEL DISP. / WASTE RECEPTACLE	B-38032
A3	TOILET PAPER HOLDER	B-4288
A4	SANITARY NAPKIN DISPENSER	B-4706C
A5a	SOAP DISPENSER – DECK MOUNT	B-824
A5b	SOAP DISPENSER – RECESSED WALL MOUNT	B-306
A6a	GRAB BAR (12” VERTICAL)	B-5806 x 18
A6b	GRAB BARS (36″)	B-5806 x 36
A6c	GRAB BARS (42″)	B-5806 x 42
A6d	GRAB BAR (TWO-WALL)	B-68137
A7a	SANITARY NAPKIN DISPOSAL - PARTITION	B-4354
A7b	SANITARY NAPKIN DISPOSAL - RECESSED	B-270
A7c	SANITARY NAPKIN DISPOSAL - WALL	B-4353
A8	SEAT COVER DISPENSER	B-4221
A9	ROBE HOOK	B-76727
A10	SHOWER ROD	B-6047
A11	SHOWER CURTAIN	B-204
A12	FOLDING SHOWER SEAT	B-5181
A13	DIAPER CHANGING STATION	KB311-SSRE

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Accessories that are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.

B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.

C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions that are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.

D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level and secure manner.

B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.

C. Secure accessories in place, at their designated locations by means of theft-proof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.

D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.

E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner’s authorized agent.

F. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.

G. Grab bars shall be installed so that they can support a three-hundred (300) lb. load for five minutes per ASTM F 446.

3.4 CLEANING AND PROTECTION

A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.

B. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.

C. Replace and/or repair, to the Owner's satisfaction, and at no additional cost to the Owner, installed work that is damaged or defective.

END OF SECTION 102813

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 104416

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900.

B. Fire suppression systems - Division 21.

1.4 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets, and accessories by one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style, and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. JL Industries.
2. Larsen's Mfg. Co.
3. Potter Roemer.

2.2 EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL rated 2-A:10-B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.4 CABINETS

A. Type and Style: Fire extinguisher cabinets shall be metal, recessed, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire-rated cabinets within fire-rated partitions.

B. Color: Fire extinguisher cabinets shall be factory pre-finished with baked enamel in the colors selected by the Architect from the standard range of colors of the selected manufacturer.

C. Design is based on "Model G-2409-R1" of Larsen's Mfg. Co. Other manufacturers noted herein may substitute their equivalent cabinet upon acceptance by the Architect.

2.5 IDENTIFICATION

A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION 104416

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 105113

METAL LOCKERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the lockers as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Steel wardrobe lockers.
2. Locker room benches.
3. Trim, closures, anchors, and accessories.

1.3 RELATED SECTIONS

A. Concrete slab - Section 033000.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For installation of lockers, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.

B. Uniformity: Provide each locker and bench as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

1.5 SUBMITTALS

A. Shop Drawings: Before any materials of this Section are delivered to the job site, submit complete shop drawings, technical data, and installation instructions to the Architect. Shop drawing must show method of installation, fillers, trim and accessories. Include locker sequencing information.

B. Samples: Submit 6" x 6" samples of manufacturer's standard finish.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 METAL LOCKERS

A. Locker Types

1. Four-tier 12" x 18" x 72" high steel lockers with 6" high closed base, equal to "Traditional Collection" manufactured by ASI Storage Solutions, or equal made by Penco Products, Republic Steel, or approved equal meeting these specifications.

2. Two-tier, Z-configuration steel lockers 12" x 18" x 72" high with 6" high closed base, equal to "Traditional Collection" manufactured by ASI Storage Solutions, or equal made by Penco Products, Republic Steel, or approved equal meeting these specifications.

2.2 MATERIALS

A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.

2.3 FABRICATION, GENERAL

A. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld or rivet connections; bolted connections not permitted. Grind exposed welds flush. Do not expose rivet heads on fronts of locker doors or frames.

B. Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.

1. Color: Provide locker units in color(s) as selected by Architect from manufacturer's standards. Concealed parts may be manufacturer's standard neutral color.

C. Door Frames: Frames shall be 16 gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members shall also be 16 gauge channel shaped, including intermediate cross frames on double and triple tier lockers.

D. Doors: Doors shall be 16 gauge, with louvers for ventilation; channel shaped on both the lock and hinge side, with angle formations across the top and bottom.

E. Body: Bottoms shall be 16 gauge. Tops, sides, backs, and shelves shall be 24 gauge. Bolt spacing shall not exceed 9" o.c.

F. Hinges: Hinges shall be full length 16-gauge continuous piano type riveted to both door and frame.

G. Handles: Handles shall be one-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks.

H. Latching: Lifting trigger shall be 14-gauge steel, attached to the latching channel. The trigger shall have a padlock eye for use with 9/32" diameter padlock shackle. Doors to

have latch clip engaging frame at three points on doors over 42" high and two points on all other doors. Locking device to be positive automatic type, whereby locker door may be locked when open, then closed without unlocking. A rubber silencer shall be firmly secured to the frame at each latch hook.

2.4 LOCKER ACCESSORIES

A. Equipment, Z Lockers: Furnish each locker with one double-prong ceiling hook.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals not less than 3/8" high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Filler Panels: Provide filler panels where required of not less than 16 ga. steel sheet, factory-fabricated and finished to match locker units.

2.5 LOCKER ROOM BENCHES

A. Manufacturer's standard units with laminated hardwood tops approx. 9-1/2" wide by 1-1/2" thick, in lengths as indicated. Furnish steel pedestal supports not more than 6'-0" o.c., with provisions for concealed fastening to floor and securing to bench. Furnish all anchorages. Apply manufacturer's standard clear coating to bench tops and baked enamel finish to pedestals.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where lockers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Space fastenings 36" o.c. and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal all fasteners.

C. Install trim, sloping top units, and metal filler panels using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

D. Install benches to comply with manufacturer's instructions in such a manner that they resist a 200 lb. load applied laterally to benches.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes; replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105129

PHENOLIC LOCKERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the phenolic lockers as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Phenolic wardrobe lockers.

2. Trim, closures, anchors, and accessories.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 033000.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For installation of lockers, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.

B. Uniformity: Provide each locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

C. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

1.5 SUBMITTALS

A. Shop Drawings: Before any materials of this Section are delivered to the job site, submit complete shop drawings, technical data and installation instructions to the Architect. Shop drawing must show method of installation, fillers, trim and accessories. Include locker sequencing information.

B. Samples: Submit 6" x 6" samples of manufacturer's standard finish.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Provide phenolic lockers equal to "Traditional Plus" with perimeter ventilation manufactured by ASI Storage Solutions, or comparable product by Bobrick Washroom Equipment, Bradley Corporation, or approved equal.

1. Refer to the drawings for locker elevations at Men’s Locker Room and Women’s Locker Room.

2.2 MATERIALS

A. Doors shall be constructed of 1/2" solid phenolic core decorative plastic laminate with multiple resin-impregnated kraft and surface sheets fused at high temperature and pressure.

B. Side and back panels shall be constructed of 3/8" solid phenolic core with Folklore Celesta decorative plastic laminate with multiple resin-impregnated kraft and surface sheets fused at high temperature and pressure.

C. Tops, bottoms, and shelves shall be constructed of 1/2" solid phenolic core decorative plastic laminate with multiple resin-impregnated kraft and surface sheets fused at high temperature and pressure.

D. End cover panels shall be constructed of 1/2" solid phenolic core decorative plastic laminate with multiple resin-impregnated kraft and surface sheets fused at high temperature and pressure.

E. Slope top kits, filler kits, and trim kits shall be constructed of 1/2" solid phenolic core decorative plastic laminate with multiple resin-impregnated kraft and surface sheets fused at high temperature and pressure.

2.3 CONSTRUCTION

A. Doors shall be fitted with recessed handle, number plate, padlock hasp, and locking device. Perimeter ventilation. Doors shall be mounted to side panel using powder coated steel piano-type hinges and machined fasteners. Door edges shall be smooth and chamfered with corners radiused.

B. Side panels shall be attached to all tops, bottoms, and shelves, using rust-resistant and steel fasteners. Exposed edges shall be smooth and chamfered.

C. Tops, bottoms, and shelves shall be attached to all side panels using rust-resistant and steel fasteners. Exposed edges shall be smooth and chamfered.

D. Color and Texture: As selected by the Architect.

2.4 HARDWARE

A. Doors

1. Hinges: Powder coated steel, 120-degree limited hinge.

2. Latches: Mounted at the mid-point of each door.

3. Digital keypad lock.

B. Fasteners shall be rust-resistant; door hinges, latches and handles shall be mounted with rivets and/or machine screws. Hooks and number plates shall be mounted with rivets.

C. End Cover Panels: Mounted with stainless steel barrel screws.

D. Locker units can be banked together with stainless steel barrel screws.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf minimum 15 inches (381 mm) above finished floor.

2. Where hooks, coat rods, or additional shelves are provided, locate maximum 48 inches (1219 mm) above finished floor.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where lockers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

END OF SECTION 105219

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 10 56 13

METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide Metal Storage Shelving as indicated on Drawings and as specified herein.

1.2 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. American National Standards Institute (ANSI)

C. Storage Equipment Manufacturers Association

D. Material Handling Industry of America (MHIA)

1.3 SUBMITTALS

A. Product Data: Manufacturer's technical data, specifications and catalog sheets indicating compliance with rated capacities, material descriptions and finishes for metal storage shelving.

B. Shop Drawings

Indicate layouts and locations, with dimensions and sizes, bracing, anchorage, and other pertinent information.

C. Samples

Submit three (3) samples of each component of shelving. Submit color samples.

D. Quality Assurance Submittals

1. Manufacturer's qualifications.

2. Installer's qualifications.

1.4 QUALITY ASSURANCE

A. Manufacturer of metal storage shelving shall have had successful experience of five (5) years, minimum, in manufacturing shelving of type specified.

B. Installers shall be experienced in metal shelving installation.

C. Shelving shall comply with requirements of ANSI MH28.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shelving to site in unopened factory-sealed containers, clearly labeled as to product, manufacturer, color and other pertinent information.

B. Store and handle shelving under conditions as outlined under Section 016000 *Product Requirements* and as recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Lyon Metal Products, Inc., Aurora, IL

B. Penco Products, Inc., Oaks, PA

C. Republic Storage Systems Co., Canton, OH

2.2 SHELVING MATERIALS

A. Provide Four-Post Metal Storage Shelving, field assembled from factory-formed components. Shelves shall span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide upright posts, braces, shelves, ends, ledge supports, angle knee floor fasteners, kick plate base covers, base clips, bin fronts, label holders, and accessories indicated on Drawings, or as required for complete installation. Provide fixed top and bottom shelves, adjustable intermediate shelves, and other accessories where indicated.

1. Upright Posts: Fabricated from hot-rolled steel; in angle, T, tubular T or box shape; with perforations at 1½" o.c. to receive shelf-to-post connectors. Gauge of Posts to be determined by manufacturer's specifications, based on the Total Load on each post. The total Load of each post is to be calculated by the number of shelves with a Carrying Capacity per Shelf for a minimum of 500 lbs.

2. Solid-Type Shelves: Shall have a load-carrying capacity of 500 lb. minimum per Shelf. Shelves shall be a minimum of 18-gauge thick or of a thicker gauge when required based on load-carrying capacity per shelf. Vertical edges of shelf shall be a minimum $1^{3}/_{16}$" high.

   a. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded or vertical edges that are flanged and returned with edges reinforced with steel bars strips.

3. Braces: 12-gauge x 3/4" steel flats or manufacturer's standard, diagonal cross bracing. Located at back and ends as required for stability, load-carrying capacity of shelves and number of shelves indicated.

4. Back Panels: One piece fabricated from cold-rolled steel sheet, minimum 24-gauge or thickness as required for load carrying capacity per shelf.

5. Finished End Panels: Minimum 24-gauge steel (where shelving does not terminate at wall and metal ends are not provided), fabricated as solid full height panels with same finish as posts, with trim for a finished appearance along edges abutting posts and top shelf.

6. Shelf clips: 14-gauge steel minimum.

7. Base Strip: Fabricated from same material and with same finish as shelving. 18-gauge steel

8. Side shelf supports: 1" x 1¾", 14-gauge steel angle.

9. Label Holders: 24-gauge steel, continuous strip type.

10. Foot Plates: 13-gauge zinc-plated steel

B. Provide the following custom item materials:

1. Shelving End Joint Cover (at first shelf): 12-gauge steel.

2.3 FINISHES

A. Finish steel components as follows:

Machine clean and treat with phosphate solution, dip coat or electrostatically spray high-grade enamel paint and bake at 300°F minimum.

B. Colors

As selected by Project Architect from manufacturer's standard range of colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Four-Post Shelving

Erect and connect components properly. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.

3. Adjust post-base bolt leveler to achieve level and plumb installation.

4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.

5. Connect side-to-side and or back-to-back shelving units together.

6. Install shelves in each shelving unit at spacing indicated on Drawings.

   a. Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.

B. Accessories

1. Install finished end panels and trim at exposed ends of shelving units.

2. Shelf-Label Holders: Install on each shelf.

3.2 ERECTION TOLERANCES

A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch in 10 feet of height.

3.3 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Touch up marred finishes or replace shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by shelving manufacturer.

C. Replace shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 10 56 26

MOBILE STORAGE SHELVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other sections regarding related specifications, apply to this Section.

1.2 SUMMARY

A. This section includes the following:

1. High-density mobile storage units mounted on mechanically assisted carriage, support rails, fabrication and installation including leveling of support rails.

2. 4-Post shelving units, fabrication and installation on mobile carriage.

B. Related Work, Not Furnished:

1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including loads of storage units to be installed. Provide a maximum allowable sub floor deflection of L/360 under specified mobile storage loads.

2. Finish floor covering for concrete with recessed rail installation.

3. Fire suppression system is by others

C. Related Sections:

1. Section 033000 'Cast-in-Place Concrete'

2. Section 096519 'Resilient Tile Flooring'

3. Division 26 for wiring for Add Alternate.

D. Alternates:

1. Add Alternate for Motorized Controls.

1.3 PERFORMANCE REQUIREMENTS

A. Due to the user's preference, requirements for safety, performance, and flexibility, all following specification line items are mandatory.

B. Seismic Performance: Provide mobile carriages and shelving capable of withstanding the effects of earthquake motions as determined according to IBC 2006 and local building codes.

C. Design Requirements: All mobile carriage and shelving elevations as per drawing set.

D. Color Samples: Provide sample for each exposed product and for each color required.

E. Selection Samples: For selection of colors and textures, submit manufacturer's color charts consisting of actual product samples, showing full range of colors and textures available. Vendors must provide a minimum of 12 color selections in powder coat paint finish.

F. Installer Qualifications: Employ an experienced installer who is the manufacturer's authorized and certified representative.

1. Minimum Qualifications: 1-year experience installing systems of similar size and complexity to specified project requirements

2. Manufacturer Certification: Required by manufacturer on manufacturer's letterhead required at time of bid. Certifications by sales representatives, dealers, or distributors are unacceptable. Qualification must include resume of certified installation supervisor.

3. Provide support within 24 hours for service call.

G. Warranty: Submit a written warranty, executed by contractor, installer and manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to, not limitation of, other rights the owner may have against the contractor under contractual documents.

Lifetime Limited Warranty: For the lifetime of the shelving and mobile carriages ("structural frames"). For the purposes of this warranty, structural frames shall be deemed to exclude all moving parts, controls and guides that have immediate contact with any moving parts.

5-year Limited Warranty: For five (5) years from the date of Substantial Completion for all equipment other than structural frames and motors. During the 5-year warranty period, all parts are included at no cost for 5 years. Labor installation is included at no cost during the first year of the 5-year warranty period.

H. Reference List: Provide a list including a minimum of three (3) previously installed mobile storage site to be contacted or visited by owner, architect and contractor. Installation must be of similar size and scope of the specified system. A visit is intended to inspect the operation, the quality of installation and verify the suitability of manufacturer's products to compare to the materials and products specified. Manufacturer is required to address all issues raised by the owner, architect and contractor. List must include contact names, phone numbers or e-mails, and the size and quantity of shelving units.

I. Project Schedule: Provide a project achievement plan detailing all critical elements necessary to plan, manufacture, ship, and install shelving product. Include critical project milestones and risk mitigation plan.

J. Manufacturer Qualifications:

1. ISO 9001:2008: Engage an experienced manufacturer who is ISO 9001:2008 certified for the design, production, installation and service of powered mobile systems. Submit manufacturer's ISO 9001:2008 quality system registration certificate.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, schematics, testing data, and other items as described in this specification. Include data substantiating that products to be furnished comply completely with requirements of the contract documents and specifications. Include installed weight, load criteria, furnished specialties, and accessories.

B. Shop Drawings: Prepared and detailing fabrication, assembly, and installation of mobile carriages and storage shelving, as well as procedures and diagrams. Include details of layout and installation, as well as clearances, spacing, relation to adjacent construction in plan, elevation, and section, components, assemblies, connections, attachments, reinforcements, and anchorage. Furnish floor layouts, technical, and installation manuals for every unit shipment.

1.5 QUALITY ASSURANCE (Submissions due from all bidding contractors at time of bid, failure to do so shall be cause for disqualification.)

A. Manufacturer Certifications: Provide separate written certifications by manufacturer on manufacturer's letterhead required stating compliance with all specifications of shelving systems. Shelving certifications must confirm compliance with all shelf sizes and gauges as noted in these specifications.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify mobile carriages and shelving unit location by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work

1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating mobile carriage and shelving units without field measurements. Coordinate construction to ensure actual dimensions correspond with established dimensions.

B. Delivery, Storage, & Handling: Comply with instructions and recommendations of manufacturer for special delivery, storage and handling requirements.

C. Sequence & Scheduling: Sequence mobile carriage and storage shelving system installation with other work to minimize possibility of damage and soiling during the remainder of the construction period.

D. Pre-Installation Conference: Conduct conference at project site. Review methods and procedures related to installation of mobile carriage and storage units including, but not limited to, the following:

1. Inspect and discuss condition and levelness of flooring and other preparatory work performed under other contracts.

2. In addition to the contractor and the installer, arrange for the attendance of the following:

a. Other Installers affected by the work of this section.

b. The Owner's Construction Manager.

c. The Architect.

d. Manufacturer's representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products:

1. Datum Storage Solutions Inc, 89 Church Road, Emigsville, PA 13318
(800) 828 8018 https://datumstorage.com/

'Mobile Trak5' high-density storage system.

2. Spacesavers, 1450 Janesville Avenue, Fort Atkinson, WI 53538
(800) 492-3434 www.spacesaver.com

Standard Mobile System with Mechanical Assist

3. Montel Inc, Satellite Beach, 1170 Florida A1A, 32937
(877) 935-0236 www.montel.com/en

'Mobiliex' Mechanical-assist mobile storage system

4. Or Approved Equal for mobile shelving system that meets all specification requirements and receives approval by Architect.

2.2 BASIC MATERIALS

A. Grout:

1. General: The compound shall be hydraulic type cement which, when mixed with water, will harden to produce a permanent bolt setting anchor. The compound shall conform to the following specifications, all of which are based on the performance of the test specimens at room temperature and in laboratory environment.

2. Linear Movement: It shall not shrink on setting, but shall exhibit a slight expansion of not more than .002 inch per linear inch.

3. Compression Strength: Two (2) inch cubes made in accordance with ASTM standards tested on a Balding-Southward machine of 60,000 pounds capacity shall have the following minimum average compression strengths:

Age 1 hour - 4,500 PSI

7 days - 8,000 PSI

4. All tracks shall be grouted the entire length of each run, including all track joints. As the grout slightly expands during the cure process, it shall be in permanent contact with the grouted structural members. This provides a continuous support to the system, and optimal weight distribution on the existing floor slab.

2.3 MANUFACTURED COMPONENTS – MOBILE

A. Tracks:

1. Rails shall be designed and manufactured to carry loads of 1,000 pounds per linear foot (1385kg/m) of carriage. Made of minimum cold rolled steel (CRS) rail assembly of ¾" (19mm) high x 1" (25mm) wide inserted in a corrosion resistant aluminum sub-rail treated against oxidation caused by concrete. Rail contact surface shall be minimum 1" (25mm) wide. The inserted steel rail shall be replaceable. One-piece rails with no sub-rails or corrosion barrier are not permitted.

2. Sub-rails shall be leveled with self-leveling screws above or below the walking surface. Shims shall not be accepted.

3. Sub-rails shall be designed to be anchored on top of structural concrete floor and to allow for adjustment so sub-rails can be leveled over an uneven floor.

4. In the sub-rail, the opening adjacent to rail which accommodate manufacturer's carriages guidance system and/or anti-tip system shall not exceed 7/16" (11mm) wide x ¾" (19mm) deep.

5. All rail connections shall have interlock steel rail connectors. All sub-rail connections shall have interlock steel sub-rail connectors. All track connections shall be designed to provide horizontal and vertical continuity between rail/sub-rail sections, to gradually transfer the concentrated wheel point load to and from adjoining sections. To ensure vertical and horizontal stability, tongue-and-groove connections are not permitted.

6. Tracks shall be layered and staggered to ensure a smooth weight transfer from one track to the other. Top-to-bottom track shall be without joints to support continuously the top steel rail at the junction point and provide greater structural rigidity. One-piece rails with tongue- and-groove joints and connections are not permitted.

7. Rail shall be located and positioned properly, leveled and grouted, allowing at least ¼" (6mm) for grout under high point. Anti-slip grooves under sub-rail shall prevent track to slip when grout is poured. Grout shall infiltrate inside the grooves to anchor the sub-rail to the cement. Grout to be worked under rail, any voids completely filled and trimmed upsides and flush with rails. This allows proper weight distribution from rail to existing slab.

8. Levelness of rails: 3/32" (2mm) maximum variation from true level within any system; 1/16" (1.5mm) maximum variation between adjacent rails, perpendicular to rail direction; 1/32" (0.76mm) maximum variation in 10' 0" (3.05m) of rail length, along any rail.

9. Rails are to be verified for integrity of position and levelness, as well as anchored into structural concrete slab, using anchors in sizes and quantities as determined by the manufacturer.

10. Sub-rail section shall be a minimum of 12' foot (3.66m) each and rail section shall be provided in shorter section of 10' foot (3.07m). Shorter sections are used to complete each individual rail assembly

B. Carriages:

1. All carriages shall be riveted-bonding construction for flexibility and potential reconfiguration. Welded carriages or carriages with formed lips are unacceptable. Carriages and stationary platforms shall be constructed of a full "C" shape profiles 1 ½" (38mm) deep x 5" (127mm) high, minimum 12-gauge steel, with 1,000 pounds (1385kg/m) per linear foot maximum capacity. Wheel support sections shall be minimum 12-gauge steel and shall be riveted between the main support face sections, one per aisle assembly. Support sections shall be embossed to eliminate the need of filler plates between the shelving/cabinet and the C shape supports.

2. Stationary carriages, as shown on the drawings, shall be of same construction and height as the mobile carriages and anchored to rails. Setting of shelving on floor at ends of mobile runs is unacceptable.

3. Carriage face sections shall provide a smooth, clean appearance without any assembly holes or protruding hardware.

4. Carriage straightness shall have no more than ¼" (6.35mm) maximum deviation from a true straight line. There shall be no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.

5. Carriage construction shall be designed to allow the shelving uprights to be secured to the carriage frame with two assembly kits per upright of vibration-proof graded 5" bolt, nut, and clamp anchor assemblies and so that there is no visible hardware on carriage face. Recess design carriages are not permitted. Self-drilling screw attachment is not acceptable method of attachment shelving units to the carriage. No shelving or cabinet attachment hardware shall be visible on exterior face of carriages

6. Each carriage shall have two wheels per rail.

7. Carriages shall have powder coat (1.5 mil) finish on all surfaces. Color selection by the Architect to match shelving. Powder coat paint finish is required for finish durability and elimination of any off gassing. Finish shall be inert, with no volatiles present in finished product. Visible galvanized steel structural carriage components are unacceptable.

C. Drive/Guide System:

1. Direct-Drive System: Provide with full-length drive shaft which prevents carriage whipping, binding and excessive wheel and rail wear under normal operation. All wheels shall be direct-driven at every rail location on one side of carriage. Synchronized drive with multiple chains, trolleys, and drive shafts are not acceptable.

2. Torque-Resistant Tubular Drive Shaft: Minimum of 1 5/16" (33mm) outside diameter by maximum 1 1/8" (29mm) inside diameter. Solid steel rod is not acceptable.

3. Dual-Flange Wheels: Provide positive guidance and tracking. Guidance requiring cam followers and ball bearings running on either side of the rail is unacceptable.

4. Narrow Guidance Channels: Provide a maximum 3/8" (9.5mm) between sub-rail and rail sections to reduce tripping hazards, allow carts to easily roll over, prevent debris accumulation, and facilitate cleaning.

D. Wheels:

1. Wheels shall be constructed of solid minimum 1045 cold rolled steel (CRS) for smooth operation. Minimum load capacity per wheel 3,200 pounds (1,452kg) Wheels shall be precision ground, balanced. All bearings shall be permanently shielded and lubricated

2. All wheels shall be minimum 5" (127mm) diameter (outside dimension). They shall be dual- flanged and sloped to insure efficient guidance. Load wheels shall have spherical surface to reduce friction and facilitate ease of use; drive wheels shall be flat. Single center flanged wheels are not acceptable.

3. Due to carriage length and shelving heights, guide wheels shall be at all wheel locations.

E. Face Panels:

1. Materials: All exposed face panels shall be steel. Face panels shall be located on all operating ends of ranges as shown on drawings.

2. Finishes: Selected by the Architect from manufacturer's standard available colors and patterns.

3. Face panels must cover the full height and width of shelving.

F. Motors [Add Alternate only]:

1. Each carriage shall be equipped with a minimum of one (1) 90 VDC current limited, fractional horsepower gear motor.

2. Gear motor shall be connected to a full-length shaft at all rail locations to avoid potential distortion.

G. Control Boards [Add Alternate Only]:

1. Control boards shall offer capability to be upgraded with new generations of software.

2. TCP/IP protocol connectivity shall be provided with control boards

H. Movement Controls [Mechanical Assist] :

1. The system shall be of the mechanical assist type having a chain sprocket drive system. A driving system is required to provide uniform movement along the total length of the carriage even with unbalanced loads on the carriage. The system shall be a positive drive to ensure that there is no play in the drive handle and the carriage will stop without drifting. All components of the system shall be compatible for smooth non-jerking, even movement along the total length of the carriage. Drive system shall have a minimum gear ratio requiring 1 pound of pressure to move a load of 6000 pounds. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

2. Operating handles shall be three-spoke type (single spoke handle are unacceptable) of 18 ¾" diameter transmitting power through a chain drive to the drive wheels. Provide operating handles on drive end of carriages as noted on drawings. Each

mechanical device shall come with a chain-tensioning adjuster. Handle must be mounted at 39½" from the bottom of the carriage.

I. Movement Controls [Add Alternate only]:

1. Simple LCD Controls. Provide a Simple Control with LCD display on the accessible (open) end of each mobile carriage.

a. Simple Controls with LCD Display shall include two arrow shaped OPEN backlit buttons, and a STOP backlit button. Provide a 32-character display for module status and additional safety. Display shall be permanently backlit.

2. Each carriage shall have a control centered on the face panel and located at 41" (1041mm) (from the base of the carriage to the base of the control).

3. All controls and indicator lights shall be solid state and shall provide visual indication of safety module operation. Controls shall offer illuminated feature on the stop and the arrow buttons for additional feedback to the user and allow easy visual status from across the room. Only the safe and available operational functional shall be the illuminated functional options for the user. Controls shall feature a module error backlit indicator light in case of any abnormality.

4. The control's housing shall be impact-resistant

5. Sealed membrane control technology to ensure maximum life duration of controls. Mechanical push button controls or membrane activating mechanical push button controls are not acceptable. Membrane controls shall be sealed for water and dust penetration, as well as chemical-resistant.

J. Safety Features:

1. Locking Flip-down latch (for single access): Shall be located on the handle. The user shall flip down the locking latch, which will lock the respective carriage. When engaged, the locking latch will display red with visible 'LOCKED' visible to users. Pull-out pins are unacceptable. Both carriages on each side of the aisle must be secured.

2.4 MANUFACTURED COMPONENTS – 4-POST SHELVING

A. Upright frames: Upright frames are made of two or more cross members welded to the top and bottom (and center if necessary) of the post and form a rectangular upright frame. Each post shall be made of 16-gauge 1 ¼" x 1 ½" rectangular shaped cold rolled steel. The lateral sides of the posts are slotted at every one inch increment. The slots are 3/16" wide x 5/8" long and are designed to accommodate a variety of shelf and roll-out drawer configurations. The back of the post is also slotted at every 1 ½" increment with two rows of slots side by side from top to bottom. They are 3/16" wide x 5/8" long with 3/8" between the two rows. The uprights must allow for component integration on either 1" or 1 ½" increment depending only on the selected shelf component. Due to aesthetic concerns, user's performance requirements, safety of users and stored materials, and to provide maximum flexibility, "L & T 4-Post" utility shelving system styles are unacceptable.

B. Cross members: Cross members are 4" high x ½" wide. They are made of 16-gauge steel folded to create a "U" shape channel. At both ends, hook type design allows to snap the

cross members in both rows of slots at the same time. In seismic zones, the cross members are welded to the post. Non-welded frames must be available to minimize shipping volume, thus reducing truck pollution.

C. Levelers: Each post shall have an integrated leveler, inserted into formed upright tube, which allows for ¾" adjustment to accommodate for uneven floor surface. No temporary shims or other third party leveling device will be accepted.

D. Center back panel on double face sections: Center back panels are made of 20-gauge steel and constructed in such a way as to form and integral finished product.

E. Full-back panel for single sections: Full-back panels are made of 20-gauge steel box formed ½" thick and affixed to the post to form an integral finished product.

F. Supported Type Shelving:

1. Full-depth shelves: Full-depth shelves are made of box rolled formed 22-gauge steel, with "Four Bend" ¾" edge construction which adds additional strength and capacity as well as it creates a hidden safety edge to protect people and items. The full-depth shelves are supported by two longitudinal shelf supports and the appropriate number reinforcement channels. Shelves are also available in 18-gauge steel as an option.

2. Longitudinal supports: ¾" high supports are made of one "U" shaped 12-gauge steel channel. A standard formed steel claw is welded at each end to form a complete support. These supports are inserted into the slots located at the back of the post.

3. Front-to-back reinforcement channels: ¾" high reinforcement channels are made of 12-gauge steel formed in a "U" shaped channel and are sitting on the longitudinal shelf supports.

4. Base support: A 12-gauge steel special "U" shaped channel is provided for the bottom shelf. The support is inserted at the bottom of each post and anchored to the floor or to the carriage, in compliance with seismic standards.

G. Hooked Type Shelving:

1. All shelves and canopy tops shall be constructed of minimum 18-gauge steel with "Four Bend" ¾" edge construction and clipped on the uprights with use of steel hooks. No raw steel edge shall be visible or felt under each shelf's surface. Welded reinforcement can be added to accept heavier loads. Shelves floating on support are unacceptable (1" thick shelf with 3 bends also available). No portion of shelf storage capacity can be obstructed or otherwise blocked by support posts.

2. All shelving shall be back-to-back shelves and must be designed in a manner that will allow removal of shelves, trays, and drawers without the use of tools or otherwise disruptive actions. Shelves must have the ability to be individually added, removed, or adjusted without disrupting or otherwise impacting adjacent shelves' placement. Canopy tops required on all sections.

3. To provide maximum flexibility, all shelves must be adjustable on 1" centers along the entire height of upright.

4. Maximum deflection under load; must maintain L/140 based on a uniform distributed load of 50 pounds per square foot.

H. Sway brace (required with back-to-back hooked type): 1 1/8" wide sway braces are made of two 16-gauge steel bars, assembled with a rivet. Sway braces are connected to the posts by means of mechanical rivet or dowel pins. Sway braces are positioned where needed on taller shelving sections to add lateral stability.

I. End panels: Shall be constructed of 20 gauge steel, 2" thick, they are bolted to bottom and top upright cross members.

J. Side closure panels (optional): Shall be constructed of 20-gauge steel, they are formed to be flush with the edge of the shelving upright and bolted to bottom and top upright cross members.

K. Plain back stops (single entry): Shall be 5 17/32" high formed of 20-gauge steel with a 3/8" bend on top and bottom and a 1 3/16" bend on each side.

L. Slotted back stops (single entry): Shall be 5 17/32" high formed of 20-gauge steel with a 3/8" bend on top and bottom and a 1 3/16" bend on each side. Slots are located on 1" increments for divider adjustment.

M. Plain center stops (double entry): Shall be 4 3/16" high formed of 20-gauge steel with offsets bends to center on upright frame.

N. Slotted center stops (double entry): Shall be 4 3/1" high formed of 20-gauge steel with two offset bends. Slots are located on 1" increments for divider adjustment.

O. File dividers: Shall be formed of 20-gauge steel with one lug at the top rear and two lugs on the bottom to engage slots in the shelf for easy adjustment on 1" horizontal centers. The front top corner of the divider is rounded with an approximate 2" radius.

P. Sliding reference shelf: Shall be 11" deep and made of 20-gauge steel reinforced on each side with steel angles to secure slides. Shall operate on double extension ball bearing slides equipped with rubber bumpers on each end of travel. The assembly is securely attached to underneath the storage shelf, flush with the front edge.

2.5 FINISH SPECIFICATIONS

A. Shall be the finest of their respective kinds and those best adapted to the construction for which they are employed to meet ISO 9001:2008 quality standards. All steel shall be superior quality mild, cold rolled, pickled, and double annealed, free from scale and buckle. All gauges are U.S. standard. The design of all parts shall be such that the completed installation shall present a neat and finished appearance and shall be free from exposed sharp edges or projections. All other special materials shall be as hereinafter specified.

B. All components shall be painted with an electrostatically applied powder coat finish. All steel parts shall be machined smoothed and thoroughly cleaned by a process of completely washing in a phosphatizing solution to insure removal of oil, grease or other foreign material which could interfere with the adhesion of the priming coat in any way. Following the cleaning process, all parts shall be coated and confirming every part is thoroughly and completely covered with fine powder coat, and baked to the paint manufacturer's recommendation. The finish for powder coat shall be medium gloss, giving a reading of 35 to 65 degrees on a standard gloss meter and must be capable of

withstanding severe hammer and bending tests without flaking. The finish for epoxy-polyester hybrid powder coat shall be a minimum 1.2 mil thickness capable of resisting methyl ethyl ketone, salt spray, abrasion and printing, and all normal usage resistant requirements of a good finish. In addition, powder coat shall not be off gassing to prevent deterioration of collection and other stored materials. Colors to be selected by owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine subfloor surfaces, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of mobile storage units.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components and accessories after finishing operations, including painting, have been completed. Install shelving units to comply with final layout drawings, in strict compliance with manufacturer's printed instructions and structural calculations. Position unit's level and plumb at proper location relative to adjoining units and related work

B. Field Quality Control: Remove and replace components that are chipped, scratched, or otherwise damaged and which do not match adjoining work. Provide new matching units, installed as specified and in manner to eliminate evidence of replacement.

C. Adjust: Adjust components and accessories to provide smoothly operating, visually acceptable installation.

D. Cleaning: Immediately upon completion of installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

E. Protection: Protect system against damage during remainder of construction period. Advise Owner of additional protection required to ensure shelving units will be without damage or deterioration at time of substantial completion.

3.3 DEMONSTRATION/CUSTOMER TRAINING

A. Provide complete training to end-user's staff. Training shall include general safety and operation instructions, and basic preventative maintenance procedures.

END OF SECTION 105626

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 107500

FLAGPOLES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the flagpoles as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Concrete - Section 033000.

1.4 QUALITY ASSURANCE

A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.

B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavier pipe sizes if required for flagpole type and height shown.

C. Pole Construction: Construct pole and ship to site in one piece, if possible. If more that one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.

B. Shop Drawings: Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

C. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be required.

1.6 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.

B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. Aabec Pole Div., Morgan-Francis Co.
2. Acme Flagpole, Div., Lingo Inc.
3. American Flagpole, Div. of Kearney-National
4. Concord Industries, Inc.

2.2 FLAGPOLE MATERIALS

A. Provide cone tapered aluminum flagpoles fabricated from seamless extruded tubing complying with ASTM B241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 35,000 psi and a yield of 30,000 psi. Heat-treat and age-harden flagpoles after fabrication.

B. Flagpole units shall have internal halyard system conforming to the following:

1. Center (Qty 1): 35' exposed height, 8" butt, 4" top diameter, in wall thickness of .188, ground set.
2. Flanking (Qty 2): 30' exposed high, 8" butt, 4" top diameter, in wall thickness of .188, ground set.
3. Finish: Custom powder-coated finish.
4. Ball: 4" dia., seamless, aluminum, 14 ga., to match pole finish.
5. Truck: Extra heavy, non-fouling, ball-bearing, revolving truck, heavy duty; finish to match pole finish.
6. Winch Assembly: For raising and lowering flag, heavy duty winch assembly shall have bronze drum and hardened steel gear. Mount winch on galvanized steel frame within flagpole. Shaft of winch shall finish flush with outside face of pole through 1" (max.) diameter hole. Provide aluminum plug for winch shaft hole; plug to screw in, to finish flush with pole and to have same finish as pole. Provide removable winch handle. Provide access door in flagpole opposite winch. Access door to finish flush with pole, have same finish as pole, have concealed stainless steel hinges and lock, have stainless steel cylinder lock flush with door, and have hairline joints between door and pole.
7. Halyard: Provide one concealed, continuous 3/16" min. diameter stainless steel aircraft type cable. Halyard shall run concealed within pole from winch to top of pole, and then exposed over sheave and extend down outside of pole for sufficient length to properly fit flag. Flag end of halyard shall have two white neoprene-covered bronze swivel snaps, spaced for flag size. Flag size shall be determined by Architect. At bottom of flag end of halyard, provide rubber coated weight and Teflon-coated stainless steel rope sling around pole.

8. Foundation Tube: Provide 16 ga. min. galvanized corrugated steel tube, or 12 ga. rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

9. Base: Equal to No. 1240 made by American Flagpole, finish to match pole.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where flagpoles are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish and other foreign matter from excavation, and moisten earth before replacing concrete.

B. Concrete: Provide concrete composed of Portland cement, coarse aggregate, fine aggregate and water, mixed in proportions to attain 28-day compressive strength of not less than 3000 psi. Use not less than 5 sacks of Portland cement, complying with ASTM C150, per cu. yd. of wet concrete.

1. Place concrete immediately after mixing. Perform chuting to avoid segregation of mix. Compact concrete in place by use of vibrators to consolidate.

C. Flagpole Installation: Install flagpoles plumb and in compliance with final shop drawings and manufacturer's instructions.

1. Provide positive lightning ground for each flagpole installation.

2. Paint portions of ground-set flagpole below grade with heavy coat of bituminous paint.

3. At time of erection, remove all protective wrappings.

END OF SECTION 107500

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 113100

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the appliances as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Division 01: 016000 ‘Production Requirements’

B. Division 06: Section 064116 ‘Casework’

C. Diviosn 06: Section 066616 ‘Solid Surfacing Fabrications’

D. Sinks and related plumbing fixtures - Division 22.

E. Electrical - Division 26.

1.4 SUBMITTALS

A. Submit catalog cuts, product information and technical data for each appliance.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.6 DELIVERY AND STORAGE

A. Deliver products to project site in manufacturer's undamaged protective containers Delivery and storage shall conform with Section 016000 *Product Requirements*.

B. Delay delivery until spaces to receive them have been fully enclosed and utility rough-ins are complete.

1.7 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 APPLIANCES

A. Electric Cooktop (‘RA1’)

1. Electric Burners: Two radiant-type burners, 240v, drop-in.
   a. GE JP3021DPBB
   b. KitchenAid Architect Series II KECC056RBL
   c. Miele CombiSet CS1112E240V

B. GE JP3021DPBB

C. KitchenAid Architect Series II KECC056RBL

D. Miele CombiSet CS1112E240VMicrowave Oven (‘RA2’) :

1. Undercabinet Microwave drawer .
   a. Bosch 800 Series HMD8054UC
   b. Dacor Contemporary DMR30M977WM
   c. Thermador Masterpiece Professional Series MD30BS

E. Refrigerator/Freezer (‘RA3’):

1. 33” wide freestanding refrigerator with bottom freezer (Stainless steel finish).
   a. General Electric model #GDE25EYKFS
   b. KitchenAid model #KRBL102ESS
   c. Whirlpool model #WRB322DMBM

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where appliances are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

C. Upon completion of installation and hookup to utilities, put each operating component of each appliance through at least five (5) complete operating cycles, adjusting as needed to secure optimum operation level.

D. Touch up scratches and abrasions to be completely invisible to the unaided eye from a distance of five (5) feet.

E. Promptly remove from the job site all cartons and packing material associated with the work of this Section.

END OF SECTION 113100

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 11 52 23

AUDIO-VISUAL EQUIPMENT SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: LCD display mounts for wall installation.

1.2 RELATED SECTIONS

A. Section 054000 "Cold Formed Metal Framing"

B. Section 092900 "Gypsum Drywall"

C. Section 274116 "Audio-Visual Equipment"

D. Section 274116.01 "AV Equipment Lists"

1.3 ACTION SUBMITTALS

A. Refer to Section 01 33 00 "Submittal Procedures".

B. Product Data: For each LCD display mount, including manufacturer recommended installation procedures.

C. Shop Drawings: Include dimensions, method of attachment, structural and seismic support.

D. Coordination Drawings: Provide drawings and information indicating coordination between LCD Displays and display mounts.

1.4 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 "Product Requirements".

B. Deliver LCD display mounts in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Inspect for freight damage, concealed or otherwise, upon delivery to project site. Report damage to freight carrier immediately for replacement of LCD display mounts.

1.5 WARRANTY

A. Manufacturer lifetime warranty against manufacturing defects.

PART 1 - PRODUCTS

2.2 BASIS OF DESIGN

A. Chief (Legrand Inc). Phone (866) 977-3901 ; website www.legrandav.com

1. Sizes / model numbers are as per TA-series Audio-Visual drawing set:

a. MTM1U

b. XTNIU

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Bracing: General Contractor shall provide walls and soffits engineered for LCD display mount support able to resist the effects of earthquake motion in accordance with Seismic Design Category 'C'.

2.4 LCD DISPLAY MOUNTS

A. Display mount for LCD displays. Each mount attaches a single display to the wall.

1. Distance from wall: 2 to 2.5 inches to back of display.

2. Fine adjustment to height and depth positioning, allowing edge to edge multi-display mounting.

B. Display characteristics

1. Maximum display weight: 220 lb (100 kg) per mount assembly.

2. Display size: from 49″ to 98″ as indicated on TA-series Audio-Visual drawings.

PART 2 - EXECUTION

3.2 PREPARATION

A. AV Integrator shall coordinate with General Contractor for layout and installation with wall construction and related components. General Contractor is responsible for partition wall construction, including blocking, structural and seismic supports.

B. AV Integrator shall coordinate with Electrical Contractor for layout and installation. For LCD displays, the Electrical Contractor is responsible for installation of In-wall Back Boxes, as well as cabling and power to same.

3.3 INSTALLATION

A. Install Display mounts at locations and heights indicated on Architectural Drawings.

B. Utilize necessary hardware, anchors, brackets and fasteners; according to manufacturer's written instructions and as specified.

C. LCD Display mounts to be installed square and level, and without gaps between LCD Display.

3.4 FIELD QUALITY CONTROL

A. Verify equipment supports are installed securely to substrate and within tolerances recommended by manufacturer.

B. Correct deficiencies.

3.5 PROTECTION

A. Protect LCD Display Mounts after installation from damage during remainder of construction. In the event of damage, remove and replace damaged component or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 115223

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually-operated interior roller shades.

1.2 RELATED SECTIONS

A. Section 06 10 00 "Carpentry" for wood blocking for securing roller shades.

1.3 REFERENCES

A. National Fire Protection Association (NFPA): www.nfpa.org:

1. NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

B. Window Covering Manufacturers Association: www.access-board.gov:

1. WCMA A 100.1 Safety of Corded Window Covering Products (ANSI)

C. Lead Free: RoHS/Directive 2002/95/ED, US Consumer Product Safety Commission Section 101 and REACH (EC 1907/2006)

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Conference: Conduct conference at Project site. Include representatives of Contractor, Owner, Architect, roller shade Installer, and others affecting or affected by the Work. Review the following:

1. Requirements of Contract Documents.

2. Requirements of shop drawings.

3. Delivery, storage, and handling.

B. Coordination:

1. Coordinate installation of roller shades with installation of wall construction.

2. Coordinate installation of anchors and blocking indicated on roller shade shop drawings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of (roller shades) product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: For roller shades.

1. Provide plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.

2. Locations and requirements for recesses and attachments to other work, including general construction, anchorage methods and locations, and service connections and locations.

3. Include diagrams for power, signal, and control wiring including dimensioned connection locations.

4. Indicate locations for fabric selections when more than one type is required.

C. Samples for Initial Selection: For each type and color of shade material.

1. Include Samples of exposed accessories involving color selection.

D. Samples for Verification: For each type of roller shade.

1. Shade Material: Not less than 8"x10" sample.

2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.

3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

E. Window Treatment Schedule: For roller shades.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified roller shade fabricator and Installer.

B. Product Certificates: For each type of shade material.

C. Product Test Reports: For each type of shade material, certifying compliance with requirements.

D. Low-Emitting Product Certificate: For roller window shade fabric products specified to meet volatile organic emissions standards, submit GREENGUARD certification or comparable certification acceptable to Architect.

E. Lead-Free Certification: For roller window shade fabric products specified to meet lead free standards, submit RoHS certification or comparable certification acceptable to Architect.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades, to include in maintenance manuals.

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of 30 years' experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Experienced Installer, trained and certified by manufacturer, who has completed at least five installations similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

C. Fire-Test response characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Anti-Microbial Characteristics: "No Growth" per ASTM G 21, G 22, G 2180, results for fungi ATCC 9642, ATCC 9644, ATCC 9645, RITB 2101.

E. Mockups: If architect requires, provide a mock-up of one roller shade assembly specified for evaluation of mounting, appearance and accessories.

1. Locate mock-up in window designated by Architect.
2. Do not proceed with remaining work until mock-up is accepted by architect.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00 "Product Requirements" Article 1.5.

B. Do not deliver window shades until the building is enclosed and construction is substantially complete within spaces requiring shades.

C. All containers and shades to be labeled according to Window Shade Schedule

1.10 PROJECT CONDITIONS

A. Environmental Limitations: 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.

1.11 WARRANTY

A. Roller Shade Hardware: Manufacturer's standard non-depreciating twenty-five (25) year limited warranty. Chain to have manufacturer's standard, non-depreciating one (1) year limited warranty.

B. Roller Shade Installation: One (1) year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

C. Roller Shade Fabric: Manufacturer's non-depreciating ten (10) year limited warranty on fabrics installed on the interior. See Fabric Specification for specific fabric warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hunter Douglas Architectural Window Coverings, 9900 Gidley Street, El Monte, California, 91731. Telephone: (800) 727-8953 Fax (800) 205-9819 www.hunterdouglasarchitectual.com/windowcoverings

B. Roll-A-Shade, Inc.; 12101 Madera Way, Riverside, California, 92503 Telephone: (951) 245-5077; Fax (951) 245-5075 Email: Bids@rollashade.com, www.rollashade.com

C. Mecho Shade Systems, LLC. 42-03 35th Street, Long Island City, New York, 11101. Telephone: (718) 729-2020; Fax (718) 729-2941 Email: marketingcommunications@mechoshade.com www.mechoshade.com

2.2 ROLLER SHADE TYPES

A. Manual operating interior, chain driven, roller shades at the grade-level windows of rooms and spaces indicated on the Drawings (A-801 Reflected Ceiling Plans).

2.3 ROLLER SHADE COMPONENTS

A. Rollers: Extruded aluminum or corrosion-resistant aluminum tubes sized to accommodate roller operating mechanisms and specified Shades without deflection. Equip with permanently-lubricated drive-end and idle-end assemblies configured to allow removal of Shades for servicing.

1. Direction of Shade Roll: Regular, from exterior face of roller.

2. Shade-to-Roller Attachment: Manufacturer's standard method.

B. Chain-and-Clutch Operating Mechanism: Continuous-loop bead chain and clutch that stops shade movement when bead chain is released; with upper and lower limit stops; permanently adjusted and lubricated.

1. Bead Chains: #10 qualified stainless-steel chain rated to 90 lbs. (41 kg) minimum breaking strength. Nickel plated chain shall not be accepted.

a. Loop Length: Full length of roller shade.

b. Chain-Tensioner Type: Chain tensioner, sill mounted.

c. Color: As selected by Architect from manufacturer's full range.

2. Indicate Roller Shade Type: [RS-X] .

C. Mounting Hardware: [Extended] [Manufacturer's standard] brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions.

1. Bracket to be a minimum one sixteenth (1/16) in. (1.59mm) stamped steel, or heavier as required.

2. Color: As selected by Architect from manufacturer's full range.

D. Shade Bottom:

1. Hem Bar: Extruded aluminum. Hem bar to be sealed on both ends using impulse welder.

E. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-Shaped
   b. Height: Fabricator's standard height required to conceal roller and Shade assembly when shade is rolled up, but not less than 2-1/4 inches.
   c. Color: As selected by Architect from manufacturer's full range.
2. Shade Head box: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Fabricator's standard height required to enclose roller and Shade assembly when shade is rolled up, but not less than 2-1/4 inches.
   b. Shade Headbox to be [recessed] [exposed].
   c. Color: As selected by Architect from manufacturer's full range.
3. Endcap Covers: To cover exposed endcaps.
   a. Color: As selected by Architect from manufacturer's full range.
4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 ROLLER WINDOW SHADE FABRIC

A. Light Filtering Fabrics

1. Basis of Design: 'SheerWeave' Style 2100 (10%) by Phifer: Openness Factor: Approximately 10%. Composition: 37% Fiberglass, 63% Vinyl on Fiberglass. Fire Classification: California U.S. Title 19 (small scale) NFPA 701-2004 TM#1 (small scale), NFPA 101 (Class A Rating), UBC (Class 1), British Std. 5867 and NFPA 701 TM#2 (large scale). Bacterial and Fungal Resistance: ASTM E2180, ASTM G21, AATCC30 Part 3, ASTM D3273, includes Microban antimicrobial additives.
   a. Available Patterns and Colors: as selected by Architect from standard color selection from Manufacturer.

2.5 ROLLER WINDOW SHADE UNIT FABRICATION

A. Roller Window Shade Unit Sizes: Fabricate units in sizes required to fill openings in configuration indicated:

1. Inside of Jamb Installation: Width and length equal to opening size less clearances recommended by manufacturer.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of defined vertical separations between openings.

B. Shade Fabrication: Fabricate Shades without battens or seams to extent possible, except for the following conditions:

1. Railroaded Materials: Railroad material where material roll width is less than the required width of Shade and where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roller window shade unit substrates with Installer for compliance with approved submittals and other conditions affecting performance of the Work.

B. Proceed with installation once unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Contractor shall clean Surfaces thoroughly prior to installation.

B. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

C. 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 roller window shade units level, plumb, square, and aligned with adjacent units according to fabricator's written instructions.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding, tracking or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller window shade unit surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions that ensure that roller window shade units are without damage at time of Substantial Completion.

C. Protect installed products until completion of project.

D. Replace damaged roller window shade units that cannot be repaired, before time of Substantial Completion.

3.5 TRAINING

A. Engage a manufacturer-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain manual roller shaded systems.

.END OF SECTION 12 24 13

SECTION 124816

ENTRANCE FLOOR GRILLES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the entrance floor grilles as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Concrete recess - Section 033000.

1.4 QUALITY ASSURANCE

A. Manufacturer: Except as otherwise indicated, provide entrance floor grilles and accessories by a single manufacturer for entire project.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications and installation instructions for entrance grille. Include methods of installation for each type of substrate.

B. Samples: Submit samples for each type and color of exposed entrance grille, frame and accessory required. Provide 12" square samples of grille materials and 12" lengths of frame members.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 ENTRANCE FLOOR GRILLE ASSEMBLY

A. Furnish and install "MetroSteel" stainless steel foot grille as manufactured by Matter Surfaces or approved equal by Kadee Industries or C/S Group.

Matter Surfaces, PO Box 839, 179 Campanelli Parkway, Stoughton, MA 02072; telephone 800-628-7462 or 781-344-1536; fax 781-344-1537; www.mattersurfaces.com

B. Tread Material: Type 304 stainless steel 0.090" x 0.150" surface wire, No. 4 satin finish.

1. Wire Spacing: Standard slot openings of 0.145".

2. Recycled Content: 80% pre-consumer

C. Support Rods: Type 304 stainless steel 0.070" x 1", spaced 1" on center.

D. Recycled Content: 80% pre-consumer

E. Dimension: Grille depth of 1-1/8″

F. Framing: Type 304 stainless steel with unit construction to support 300 pounds per square foot.

G. Accessories: Provide hidden locking devices to prevent warping and rattling. Furnish number of lock downs as recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where entrance floor grilles are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install angle grille frames into prepared block out. Install grille frames in accordance with the manufacturer’s installation instructions. Locate, align, and level frame members accurately to be flush with adjacent floor finishes.

B. Protection: Upon completion of frame installation and concrete work, provide temporary filler of plywood or fiberboard in grille recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project reaches Substantial Completion.

C. Delay installation of entrance floor grilles until work on the project reaches Substantial Completion.

D. Install entrance floor grilles in frame and anchor with hidden lock downs.

E. Instruct Owner’s personnel in proper maintenance procedures.

END OF SECTION 124816

SECTION 12 50 00

FURNITURE BY OTHERS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furniture for Dispatch stations, Conference Rooms, and bookshelves / storage cabinets.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

A. Division 1 'Product Requirements' (016000)

B. Division 9 'Carpet Tile' (096813)

C. Division 9 'Access Flooring' (096900).

D. Division 26 – Electrical

E. Division 27 – Communications

1.4 SUBMITTALS

A. Third-party vendors shall issue submittals in accordance with Section 013100.01 'Procore Master Instruction' – including:

1. Shop drawings
2. Samples
3. Operation & Maintenance Data
4. Warranty

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling of products shall be in accordance with Section 016000 'Product Requirements.'

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Xybix – or as selected for direct purchase by Owner.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation of furniture provided by Xybix (as indicated on the Furniture Plan schedules) shall be by Xybix.

END OF SECTION 125000

SECTION 12 93 00

SITE FURNISHINGS

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. Bollards.

2. Chain-link fences and Gates (Swing)

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete for Site Work" for installation of cast in concrete footings.

2. Division 31 Section " Earth Moving" for excavation for installation of concrete footings.

3. Products furnished, but not installed under this Section, include bollards to be cast in concrete footings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Samples for Initial Selection: For units with factory-applied color finishes.

2. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

B. Size: Not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.

1. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

C. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain site furnishing(s) through one source from a single manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.

C. Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.

1. Stainless Steel: Free of surface blemishes and complying with the following:

2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.

E. Tubing: ASTM A 554.

1. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.

F. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

G. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 BOLLARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide 6" or a comparable product by one of the following:

1. Canterbury International.

2. Columbia Cascade Company.

3. FairWeather Site Furnishings.

4. Maglin Furniture Systems Ltd.

5. Urban Accessories, Inc.

B. Bollard Construction:

1. Steel: Schedule 40 pipe.

2. Overall Height: As indicated.

3. Overall Width: As indicated.

4. Overall Depth: 4'-0" minimum.

5. Installation Method: Cast in concrete.

C. Steel Finish: Galvanized & Color coated.

1. Color: As selected by Architect from manufacturer's full range

2.3 CHAIN LINK FENCE

A. FABRIC: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.

2. Steel Wire Fabric: Wire with a diameter of 0.148 inch (9-gauge) minimum.

3. Mesh Size: 2 inch

4. Polymer-Coated Fabric: ASTM F 668, Class 1 over zinc coated steel wire.

5. Color: Black complying with ASTM F 934.

6. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

7. Selvage: Knuckled at both selvages

B. FENCE FRAMING: Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: As shown on the drawings.

2. Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance-welded pipe.

a. Line Post: 2 inches in diameter minimum.
b. End, Corner and Pull Post: 4 inches in diameter minimum

3. Horizontal Framework Members: Intermediate, top and bottom rails complying with ASTM F 1043.

a. Top Rail: 1.66 inches in diameter

4. Brace Rails: Comply with ASTM F 1043.

a. Brace: 1.66 inches in diameter

5. Metallic Coating for Steel Framing:

a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M.

6. Polymer coating over metallic coating.

a. Color: Black, complying with ASTM F 934.

C. ACCESSORIES

1. Caps: Malleable iron dome shaped; sized to post diameter, set screw retainer.

2. Fittings: Sleeves, bands, clips, rail ends, tension bars, fastener and fittings; steel.

3. Gate Hardware: Center gate stop and drop rod; two 180 degree gate hinges per leaf and hardware for padlock.

D. FINISHES

1. Hardware and Accessories: Same finish as framing.

2.4 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after paving has been completed.

C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.

1. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

3.3 INSTALLATION CHAIN LINK FENCE AND GATES

A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567.

B. Set gate and end posts plumb, in concrete footings with top of footing 2 inches above finished grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finished Grade ANSI/ASTM F567.

D. Corner, Gate and Terminal Post Footing Depth below Finished Grade: ANSI/ASTM F567.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rod, or diagonal brace rail. Install brace rail, one bay from end and gate posts.

F. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

G. Install center and bottom brace rail on corner gate leaves.

H. Stretch fabric between terminal posts or at intervals of 500 feet maximum, whichever is less or when:

1. The vertical alignment between fence sections on either side of a post changes by greater than 10 degrees or where,

2. The horizontal alignment between fence sections on either side of a post changes by greater than 15 degrees.

I. Position bottom of fabric 2 inches above finished grade.

J. Fasten fabric to top rail, line posts, braces and bottom tension wire with tie wire at maximum 15 inches on centers.

K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

L. Install bottom tension strap stretched taut between terminal posts.

M. Install gate with fabric to match fence.

N. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

O. Erection Tolerances

1. Maximum Variation From Plumb: ¼ inch.

2. Maximum Offset From True Position: 1 inch.

3. Components shall not infringe adjacent property lines.

3.4 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129300

SECTION 210500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies the basic requirements for fire protection installations and includes requirements common to more than one section of Division 22. It expands and supplements the requirements specified in sections of Division l.

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Instructions to Bidders and the Division l Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.4 SCOPE OF WORK

A. The following is a general listing of work items to be provided under this Contract. Work indicated is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed.

B. This Contractor shall refer to Division 1 for additional scope items required by Contract including but not limited to the listed as "Summary of Work Multiple Prime Contracts" for Scope of Work Summary by Contract"

C. Contractor shall furnish all materials, equipment and labor to make the following complete installations:

1. All work as shown and indicated on FP drawings and as specified in Division 21.

1.5 PRODUCT LISTING

A. Prepare listing of major fire protection equipment and materials for the project.

B. Provide all information requested.

C. Submit this listing as a part of the submittal requirement specified in the Division l Section: PRODUCTS AND SUBSTITUTION.

D. When two or more items of same material or equipment are required (pumps, valves, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.

E. Provide products which are compatible within systems and other connected items.

1.6 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated fire protection equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of fire protection materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.8 DIMENSIONAL INFORMATION

A. Dimensional information used for layout and locations shall be taken from architectural or structural drawings used by the construction trades.

B. Fire suppression drawings are diagrammatic and have no dimensional significance. Do not scale. Locations of equipment and piping are to be as:

1. Shown on Architectural drawings;

2. Directed in the field;

3. Required for proper connection of equipment to be served;

4. Required for proper symmetry in the space involved;

5. With deviations made only with specific approval of Architect.

C. Division 21 shall review the drawings of other divisions, exchange shop drawings with them, cooperate in the preparation or prepare space layouts as required, to avoid conflicts and interferences with the installation of other trades in advanced stages of construction.

D. Contractor shall field verify all existing conditions prior to installation of equipment and material. It is recommended that the contractor verify all existing conditions prior to submitting a proposal. Lack of field verification does not constitute a basis for additional monies during construction. Contractor assumes full responsibility for completeness of installation including coordination of work with other trades.

1.9 SUBMITTALS

A. Submit manufacturer's technical product data and installation instructions for fire protection materials and products.

B. Required Shop Drawings

SECTION	MATERIAL ITEM
212200	CLEAN AGEN FIRE SUPPRESSION

C. Approval Drawings: Prepare approval drawings of fire protection systems indicating pipe sizes, pipe locations, fittings, shutoffs, equipment, etc. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

D. Approval Calculations: Prepare hydraulic calculations of fire protection systems. Submit to Agency having juris diction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

E. Certificate of Installation: Submit certificate upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and NFPA 14, and also that system is operational, complete, and has no defects.

F. Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products; in accordance with requirements of Division 1.

1.10 OPERATION AND MAINTENANCE DATA

A. Refer to the Division l Section: PROJECT CLOSEOUT or OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals.

B. In addition to the information required by Division l for Maintenance Data, include the following information:

C. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

D. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions.

E. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

F. Servicing instructions and lubrication charts and schedules.

G. Record drawings of installed fire protection piping and products.

1.11 WARRANTIES

A. Refer to the Division l Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Division 22, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

B. Refer to the Division 8 Section: Access Doors.

3.2 FIRE PROTECTION INSTALLATIONS

A. Coordinate fire protection equipment and materials installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases and openings in other building components to allow for fire protection installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of fire protection materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Coordinate the cutting and patching of building components to accommodate the installation of fire protection equipment and materials.

G. Where mounting heights are not detailed or dimensioned, install fire protection services and overhead equipment to provide the maximum headroom possible.

H. Install fire protection equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

I. Coordinate the installation of fire protection materials and equipment above ceilings with suspension system, light fixtures, and other installations.

3.3 CUTTING AND PATCHING

A. This Article specifies the cutting and patching of fire protection equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.

B. Refer to the Division l Section: CUTTING AND PATCHING for general requirements for cutting and patching.

C. Refer to Division 26 Section: BASIC ELECTRICAL REQUIREMENTS for requirements for cutting and patching electrical equipment, components, and materials.

D. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

E. Arrange for repairs required to restore other work, because of damage caused as a result of fire protection installations.

F. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

G. Perform cutting, fitting, and patching of fire protection equipment and materials required to:

1. uncover Work to provide for installation of ill-timed Work;

2. remove and replace defective Work;

3. remove and replace Work not conforming to requirements of the Contract Documents;

4. remove samples of installed Work as specified for testing;

5. install equipment and materials in existing structures;

6. upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/ Engineer observation of concealed Work.

H. Cut, remove and legally dispose of selected fire protection equipment, components, and materials as indicated, including, but not limited to removal of piping, valves, trim, and other fire protection items made obsolete by the new Work.

I. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

J. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

K. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

3.4 CLEANING

A. Refer to the Division l Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

END OF SECTION 210500

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 210515

CUTTING AND PATCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Provide cutting and patching work required by work of this (sub) contract.

B. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decreased structural integrity, decreased integrity of fire proofing, decreased energy performance, increased maintenance, decreased operational life or decreased safety. Specific attention shall be paid to the 2020 NYS Building Code, including Chapter 23 with regard to boring and notching of wood structural members.

C. Requirements in this Section apply to mechanical, plumbing, fire suppression and electrical installations. Refer to Divisions 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations. Requirements of this section shall be coordinated with requirements of Division 1 sections. In the event of conflict, the more stringent requirements shall be used.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. This is to include but not be limited to the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire Protection systems.
4. Control systems.

5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. If possible, retain original Installer or fabricator to cut and patch exposed work listed below. If it is impossible to engage original installer or fabricator, engage another recognized, experienced, and specialized firm.
    a. Processed concrete finishes.
    b. Stonework and stone masonry.
    c. Ornamental metal.
    d. Matched veneer woodwork.
    e. Preformed metal panels.
    f. Roofing.
    g. Firestopping.
    h. Window wall system.
    i. Stucco and ornamental plaster.
    j. Terrazzo.
    k. Finished wood flooring.
    l. Fluid-applied flooring.
    m. Aggregate wall coating.
    n. Wall covering.
    o. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 NON-FIRE RATED PENETRATIONS

A. Refer to Specifications Sections 3 through 20.

2.2 FIRESTOP MATERIAL

A. Through-Penetration Firestop Devices, Forming Materials, and Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Warnock Hersey Certifications Listings Book or the Omega Point Laboratories Listing Directory.

B. General: Comply with requirements specified in other Sections of these Specifications.

C. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 EXECUTION

3.1 3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

2. Fit work airtight to pipes, sleeves, ducts, conduits and other penetration through surfaces.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other sections of these specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 210515

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 210515

CUTTING AND PATCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Provide cutting and patching work required by work of this (sub) contract.

B. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decreased structural integrity, decreased integrity of fire proofing, decreased energy performance, increased maintenance, decreased operational life or decreased safety. Specific attention shall be paid to the 2020 NYS Building Code, including Chapter 23 with regard to boring and notching of wood structural members.

C. Requirements in this Section apply to mechanical, plumbing, fire suppression and electrical installations. Refer to Divisions 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations. Requirements of this section shall be coordinated with requirements of Division 1 sections. In the event of conflict, the more stringent requirements shall be used.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. This is to include but not be limited to the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire Protection systems.
4. Control systems.

5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. If possible, retain original Installer or fabricator to cut and patch exposed work listed below. If it is impossible to engage original installer or fabricator, engage another recognized, experienced, and specialized firm.
    a. Processed concrete finishes.
    b. Stonework and stone masonry.
    c. Ornamental metal.
    d. Matched veneer woodwork.
    e. Preformed metal panels.
    f. Roofing.
    g. Firestopping.
    h. Window wall system.
    i. Stucco and ornamental plaster.
    j. Terrazzo.
    k. Finished wood flooring.
    l. Fluid-applied flooring.
    m. Aggregate wall coating.
    n. Wall covering.
    o. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 NON-FIRE RATED PENETRATIONS

A. Refer to Specifications Sections 3 through 20.

2.2 FIRESTOP MATERIAL

A. Through-Penetration Firestop Devices, Forming Materials, and Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Warnock Hersey Certifications Listings Book or the Omega Point Laboratories Listing Directory.

B. General: Comply with requirements specified in other Sections of these Specifications.

C. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 EXECUTION

3.1 3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

2. Fit work airtight to pipes, sleeves, ducts, conduits and other penetration through surfaces.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other sections of these specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 210515

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 210500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies the basic requirements for fire protection installations and includes requirements common to more than one section of Division 22. It expands and supplements the requirements specified in sections of Division l.

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Instructions to Bidders and the Division l Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.4 SCOPE OF WORK

A. The following is a general listing of work items to be provided under this Contract. Work indicated is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed.

B. This Contractor shall refer to Division 1 for additional scope items required by Contract including but not limited to the listed as "Summary of Work Multiple Prime Contracts" for Scope of Work Summary by Contract"

C. Contractor shall furnish all materials, equipment and labor to make the following complete installations:

1. All work as shown and indicated on FP drawings and as specified in Division 21.

1.5 PRODUCT LISTING

A. Prepare listing of major fire protection equipment and materials for the project.

B. Provide all information requested.

C. Submit this listing as a part of the submittal requirement specified in the Division l Section: PRODUCTS AND SUBSTITUTION.

D. When two or more items of same material or equipment are required (pumps, valves, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.

E. Provide products which are compatible within systems and other connected items.

1.6 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated fire protection equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of fire protection materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.8 DIMENSIONAL INFORMATION

A. Dimensional information used for layout and locations shall be taken from architectural or structural drawings used by the construction trades.

B. Fire suppression drawings are diagrammatic and have no dimensional significance. Do not scale. Locations of equipment and piping are to be as:

1. Shown on Architectural drawings;

2. Directed in the field;

3. Required for proper connection of equipment to be served;

4. Required for proper symmetry in the space involved;

5. With deviations made only with specific approval of Architect.

C. Division 21 shall review the drawings of other divisions, exchange shop drawings with them, cooperate in the preparation or prepare space layouts as required, to avoid conflicts and interferences with the installation of other trades in advanced stages of construction.

D. Contractor shall field verify all existing conditions prior to installation of equipment and material. It is recommended that the contractor verify all existing conditions prior to submitting a proposal. Lack of field verification does not constitute a basis for additional monies during construction. Contractor assumes full responsibility for completeness of installation including coordination of work with other trades.

1.9 SUBMITTALS

A. Submit manufacturer's technical product data and installation instructions for fire protection materials and products.

B. Required Shop Drawings

SECTION	MATERIAL ITEM
212200	CLEAN AGEN FIRE SUPPRESSION

C. Approval Drawings: Prepare approval drawings of fire protection systems indicating pipe sizes, pipe locations, fittings, shutoffs, equipment, etc. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

D. Approval Calculations: Prepare hydraulic calculations of fire protection systems. Submit to Agency having juris diction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

E. Certificate of Installation: Submit certificate upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and NFPA 14, and also that system is operational, complete, and has no defects.

F. Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products; in accordance with requirements of Division 1.

1.10 OPERATION AND MAINTENANCE DATA

A. Refer to the Division l Section: PROJECT CLOSEOUT or OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals.

B. In addition to the information required by Division l for Maintenance Data, include the following information:

C. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

D. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions.

E. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

F. Servicing instructions and lubrication charts and schedules.

G. Record drawings of installed fire protection piping and products.

1.11 WARRANTIES

A. Refer to the Division l Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Division 22, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

B. Refer to the Division 8 Section: Access Doors.

3.2 FIRE PROTECTION INSTALLATIONS

A. Coordinate fire protection equipment and materials installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases and openings in other building components to allow for fire protection installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of fire protection materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Coordinate the cutting and patching of building components to accommodate the installation of fire protection equipment and materials.

G. Where mounting heights are not detailed or dimensioned, install fire protection services and overhead equipment to provide the maximum headroom possible.

H. Install fire protection equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

I. Coordinate the installation of fire protection materials and equipment above ceilings with suspension system, light fixtures, and other installations.

3.3 CUTTING AND PATCHING

A. This Article specifies the cutting and patching of fire protection equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.

B. Refer to the Division l Section: CUTTING AND PATCHING for general requirements for cutting and patching.

C. Refer to Division 26 Section: BASIC ELECTRICAL REQUIREMENTS for requirements for cutting and patching electrical equipment, components, and materials.

D. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

E. Arrange for repairs required to restore other work, because of damage caused as a result of fire protection installations.

F. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

G. Perform cutting, fitting, and patching of fire protection equipment and materials required to:

1. uncover Work to provide for installation of ill-timed Work;

2. remove and replace defective Work;

3. remove and replace Work not conforming to requirements of the Contract Documents;

4. remove samples of installed Work as specified for testing;

5. install equipment and materials in existing structures;

6. upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/ Engineer observation of concealed Work.

H. Cut, remove and legally dispose of selected fire protection equipment, components, and materials as indicated, including, but not limited to removal of piping, valves, trim, and other fire protection items made obsolete by the new Work.

I. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

J. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

K. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

3.4 CLEANING

A. Refer to the Division l Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

END OF SECTION 210500

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 220000

SCOPE OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. All work under this title, on drawings or specified, is subject to the architectural general and special contract conditions for the entire project, and the contractor for this portion of the work is required to refer especially thereto, and to the architectural drawings.

1.2 SCOPE OF WORK

A. This contractor shall refer to Division 1 for additional scope items required by Contract including but not limited to the listed as “Summary of Work Multiple Prime Contracts” for Scope of Work Summary by Contract.

B. The following is a general listing of work items to be provided under this Contract. Work indicated is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed.

C. Contractor shall furnish all materials, equipment and labor to make the following complete installations:

1. Temporary water as required for work and that is necessary to maintain continuous service to building use and occupants.

2. Cutting and patching as required to accomplish the work indicated including painting finish work.

3. Complete hot water, hot water return, tempered water, and cold water distribution systems as indicated on plans for all new plumbing fixtures and equipment.

4. Complete sanitary drainage and vent piping as indicated on plans for all new plumbing fixtures and equipment to 5'-0" outside the building.

5. Furnishing and installing of plumbing fixtures, equipment and specialties.

6. Insulation and Identification of piping and valves as required by the specifications but not limited to pipe identification and valve identification for all systems.

7. Sleeves and plates including fire stop material.

8. Testing, start-up and balancing of all plumbing installations to include domestic hot water, domestic cold water, and domestic hot water return systems. Balancing work shall include rebalancing of all existing and new domestic hot water systems.

9. Servicing of plumbing equipment installed as required during guarantee period for a minimum of one year after Owner’s acceptance.

10. Provide competent factory-trained personnel at site for the purpose of instructing Owner's personnel in proper operation and maintenance of all new plumbing equipment.

11. Preparation and submission of coordination drawings to include coordination with all trades involved in the renovated and new work areas.

12. All work as shown and indicated on plumbing drawings and as specified in Division 22. Plumbing demolition work shall include but not be limited to the complete removal of material and equipment from the site.

END OF SECTION 220000

SECTION 220015

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Provide cutting and patching work required by work of this (sub) contract.

B. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decreased structural integrity, decreased integrity of fire proofing, decreased energy performance, increased maintenance, decreased operational life or decreased safety. Specific attention shall be paid to the 2020 NYS Building Code, including Chapter 23 with regard to boring and notching of wood structural members.

C. Requirements in this Section apply to mechanical, plumbing and electrical installations. Refer to Divisions 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations. Requirements of this section shall be coordinated with requirements of Division 1 sections. In the event of conflict, the more stringent requirements shall be used.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. This is to include but not be limited to the following:

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire Protection systems.

4. Control systems.

5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. If possible, retain original Installer or fabricator to cut and patch exposed work listed below. If it is impossible to engage original installer or fabricator, engage another recognized, experienced, and specialized firm.
    a. Processed concrete finishes.
    b. Stonework and stone masonry.
    c. Ornamental metal.
    d. Matched veneer woodwork.
    e. Preformed metal panels.
    f. Roofing.
    g. Firestopping.
    h. Window wall system.
    i. Stucco and ornamental plaster.
    j. Terrazzo.
    k. Finished wood flooring.
    l. Fluid-applied flooring.
    m. Aggregate wall coating.
    n. Wall covering.
    o. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 2.01 NON-FIRE RATED PENETRATIONS

A. Refer to Specifications Sections 3 through 20.

2.2 2.02 FIRESTOP MATERIAL

A. Through-Penetration Firestop Devices, Forming Materials, and Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Warnock Hersey Certifications Listings Book or the Omega Point Laboratories Listing Directory.

B. General: Comply with requirements specified in other Sections of these Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

2. Fit work airtight to pipes, sleeves, ducts, conduits and other penetration through surfaces.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other sections of these specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 220015

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 220170

MOTOR STARTERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 and Division 22 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Plumbing Contractor (PC) shall furnish all motor controls and starters as required by this contract.

B. PC shall be responsible for coordination of motor(s) with motor short circuit and overload protection device(s).

1. For motors and devices within this contract.
2. For motors within this contract and devices furnished by others (i.e., circuit breakers and/or fuses in panels furnished by the Electrical Contractor (EC).
3. For compliance of the devices with the N.E.C.
4. To ensure device(s) is sufficient for the starting current of the motor(s).
5. All costs resulting from this coordination shall be borne by the PC and EC, as regards their own work.
    a. In the event of substitutions by the PC, all costs for revising attendant work by other trades shall be borne exclusively by the PC.

1.3 ACCEPTABLE STANDARDS

Cutler Hammer
Square "D"
Allen- Bradley
Westinghouse Electric Co.

1. The starter manufacturer shall coordinate the starter with the motor actually to be installed.
2. Furnish additional accessories required to meet the sequence of operation.
3. Furnish enclosure type required for specific application and location.
4. UL listed and labeled.

PART 2 PRODUCTS

2.1 MOTOR STARTERS

A. Starter type "A" shall be a manual single phase starter for Fractional (1/2 hp and less) motors.

1. NEMA 1 enclosure (NEMA 3R water proof for outside use), 600 VAC rating.
2. Run pilot Light.
3. Lockable handle guard.
4. Thermal overload protection.
5. Auxiliary EMS relays for start/stop.

B. Starter type "B" shall be an Automatic Starter/Disconnect used for 3/4 hp to 15 hp three phase motors.

1. 1. NEMA 1 enclosure (NEMA 3R water proof for outside use), 600 VAC rating.
2. Fused Disconnect Switch.
3. Hand-Off-Automatic selector switch.
4. H-O-A pilot Lights.
5. Lockable handle guard.
6. Thermal overload relay for each phase with external manual reset.
7. Two auxiliary EMS relays for start/stop (coordinate required voltage, furnish transformer when required).
8. Phase failure and undervoltage protection with relays set for 80% voltage drop.

PART 3 EXECUTION

3.1 INSTALLATION

A. Plumbing Contractor shall furnish to the Electrical Contractor all Plumbing equipment motor starters not factory mounted. Electrical Contractor to mount and wire.

B. Use fused disconnect switches when required by the Plumbing unit manufacturer. Furnish the correct size fuses as required by the Plumbing unit manufacturer.

END OF SECTION 220170

SECTION 220413

PENETRATION FIRESTOPPING PLUMBING

PART 1 GENERAL

1.1 REFERENCES

A. UL 1479 Fire Tests of Through-Penetration Firestops.

B. ASTM E 814 Standard Method of Fire Tests of Penetration Firestops Systems.

1.2 DEFINITIONS

A. UL Fire Resistance Directory: Product directory published yearly, with supplements, by Underwriters Laboratories Inc., containing listings and classifications in effect as of the published date for product categories covered by UL.

B. Inchcape Directory of Listed Products: Product directory published yearly by Inchcape Testing Services containing listings which reflect certifications granted for materials, products, systems and equipment which have been tested by Inchcape Testing Services to recognized governing standards.

C. Omega Point Laboratories Listings Directory: Product Directory published yearly by Omega Point Laboratories, Inc. containing listed building products, materials, and assemblies which have been tested by Omega Point Laboratories to recognized governing standards.

D. Factory Mutual Approval Guide: Product directory published yearly, with supplements, by Factory Mutual Research Corp., containing listed building products, materials, and assemblies which have been tested by Factory Mutual Research Corp., to recognized governing standards.

E. F Rating: Prohibits flame passage through the system and requires acceptable hose stream test performance.

F. Company Field Advisor: An employee of the Company which lists and markets the primary components of the system under their name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation and servicing of the required products. Personnel involved solely in sales do not qualify.

1.3 DESIGN REQUIREMENTS

A. Devices and materials shall meet the hourly fire resistance ratings required by the Project as determined by UL 1479, or ASTM E 814 and be listed and detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. Exception: Where no listed designs exist that meet the requirements of a specific project condition, submit details and manufacturer's written recommendations for a design meeting the requirements. Include evidence of engineering judgement and extrapolation from listed designs.

1.4 SUBMITTALS

A. Submittals Package: Submit the following items specified below the same time as a package:

1. Product Data.

2. Samples.

3. Quality Control Submittals.

4. Firestop Schedule.

B. Product Data: Catalog sheets, specifications and installation instructions for each firestop device and material.

1. Indicate design number for each firestop proposed to be used which is detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

2. State the specific locations where each firestop system is proposed to be installed.

C. Samples: One of each product if requested.

D. Quality Control Submittals:

1. Design Data: Show details and include engineering information and manufacturer's written recommendations required under Design Requirements Article for each proposed firestop if other than a design detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

a. State the specific locations where each firestop is proposed to be installed.

2. Installer's Qualifications Data:

a. Name of each person who will be performing the Work and their employer's name, business address and telephone number.

b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

3. Company Field Advisor Data:

a. Name, business address and telephone number of Company Field Advisor secured for the required services.

b. Certified statement from the Company listing the qualifications of the Company Field Advisor, and listing of services and each product specifically listed for this Project for which Company Field Advisor is given authorization by the Company to render advice.

E. Firestop Schedule: Submit schedule itemizing the following:

1. Manufacturer's product reference numbers and/or drawing numbers.
2. UL, Inchcape Testing Services, Factory Mutual Research Corp., or Omega Point Lab design number.
3. Location of firestop material.
4. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
5. Maximum allowable annular space or maximum size opening.
6. Wall type construction.
7. Roof type construction.
8. Hourly Fire resistance rating of wall.
9. F rating.

NOTE: Firestop Schedule is for information only, and will not be acted on for approval. Refer to Sample Firestop Schedule bound in Appendix.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: The persons installing the firestopping and their supervisor shall be personally experienced in firestop work and shall have been regularly employed by a company installing firestopping for a minimum of 3 years.

B. Pre-Installation Conference: Before the firestop work is scheduled to commence, a conference will be called by the Director's Representative at the Site for the purpose of reviewing the Contract Documents and discussing requirements for the Work. The conference shall be attended by related trade Contractors (if any), their qualified firestopping installers, and associated firestopping manufacturer's Company Field Advisors.

C. Container/Package Labels: Include manufacturer's name and identifying product number, date of manufacturer, lot number, shelf life (if applicable), qualified testing and inspecting agency classification marking, curing time, and mixing instructions for multi-component materials.

D. Company Field Advisor: Secure the services of a Company Field Advisor for the following:

1. Render advice regarding suitability of firestopping materials and methods.
2. Assist in completing firestop schedule.
3. Attend pre-installation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping materials to the Site in original, new unopened containers or packages bearing manufacturer's printed labels.

B. Store and handle firestopping materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, etc.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:

1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.

2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.

3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.8 SEQUENCING AND SCHEDULING

A. Leave exposed those firestopping installations that are to be concealed behind other construction until the Director's Representative has examined each installation.

PART 2 PRODUCTS

2.1 FIRESTOPPING-GENERAL

A. Through-Penetration Firestop Devices, Forming Materials, And Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. For firestopping exposed to moisture, furnish products that do not deteriorate when exposed to this condition.

2. For firestopping systems exposed to view, furnish products with flame-spread values of less than 25 and smoke developed values less than 50, as determined per ASTM E 84.

3. For penetrations for piping services below ambient temperature, furnish moisture-resistant through-penetration firestop systems.

B. Accessories: Components required to install fill materials as recommended by the firestopping manufacturer for particular approved fire rated system.

C. Identification Labels:

1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.

2. Identify the following:
   a. “WARNING - FIRESTOP MATERIAL”.
   b. Company Name.
   c. Product Catalog number.
   d. F rating.
3. Field fabricated labels are not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing through-penetrations of walls, partitions, ceilings and roofs in the Work areas.

B. Where firestopping is missing or not intact, submit a written report to the Director’s Representative describing the existing conditions.

3.2 PREPARATION

A. Clean out openings immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove foreign materials from surfaces of openings, and from penetrating items that could interfere with adhesion of firestopping.
2. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

B. Protection:

1. Protect surfaces adjacent to through-penetration firestops with non-staining removable masking tape or other suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.

C. Substrate Priming:

1. Prime substrates in accordance with the firestopping manufacturer’s printed installation instructions using recommended products and methods.
2. Do not allow primer to spill or migrate onto adjoining exposed surfaces.

3.3 INSTALLATION OF THROUGH PENETRATION FIRESTOPS

A. Use through-penetration firestop devices, forming materials, and fill, void or cavity materials to form through-penetration firestops to prevent the passage of flame, and limit temperature rise of the unexposed surface as detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form through-penetration firestop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.

2. If the construction type(s) of the building cannot be determined, provide firestopping with fire resistance ratings as specified in the International Building Code, Tables 721.1(1), 721.1(2), 721.1(3), and 508.4.

B. Provide through-penetration firestop systems with F ratings which shall equal or exceed the fire resistance rating of the penetrated building construction.

C. Firestop through-penetrations of walls, partitions, ceilings, and roofs.

D. Permanently affix label at each firestop. Use adhesive compatible with surface construction at firestop location.

3.4 CLEANING

A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

B. Remove masking tape as soon as practical so as not to disturb the firestopping’s bond with substrate.

C. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

D. Cut out and remove damaged or deteriorated firestopping immediately, and install new materials as specified in firestop schedule.

END OF SECTION 220413

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following basic materials and methods to complement other Division 22 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete equipment base construction requirements.
3. Equipment nameplate data requirements.
4. Labeling and identifying plumbing systems and equipment is specified in Division 22 Section "Plumbing Identification".
5. Non-shrink grout for equipment installations.
6. Field-fabricated metal and wood equipment supports.
7. Installation requirements common to equipment specification sections.
8. Cutting and patching.
9. Touch-up painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping includes; tube, tube fittings, connection devices, and tubing for various applications, and of a specific material applicable for intended use.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceiling, unexcavated spaces, crawl spaces, and tunnels. Normally occupied use spaces.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces, storage rooms, and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop and at-grade locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings, chase areas, and in duct shafts.

F. Concealed Exterior Installations: Concealed from view, protected from weather conditions, and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

A. The following is a general listing of work items to be provided under this Contract. Work indicated is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed.

B. This Contractor shall refer to Division 1 for additional scope items required by Contract including but not limited to the listed as “Summary of Work Multiple Prime Contracts” for Scope of Work Summary by Contract”

C. All plumbing demolition work as indicated on the P drawings, and as specified including but not limited to the complete removal of material and equipment from the site.

D. Contractor shall furnish all materials, equipment and labor to make the following complete installations:

1. All work as outlined previously in Section 220000.

2. All work as shown and indicated on P drawings and as specified in Division 22.

1.5 DIMENSIONAL INFORMATION

A. Dimensional information used for layout and locations shall be taken from architectural or structural drawings used by the construction trades.

B. Plumbing drawings are diagrammatic and have no dimensional significance. Do not scale. Locations of equipment and piping are to be as:

1. Shown on Architectural drawings;

2. Directed in the field;

3. Required for proper connection of equipment to be served;

4. Required for proper symmetry in the space involved;

5. With deviations made only with specific approval of Architect.

C. Division 22 shall review the drawings of other divisions, exchange shop drawings with them, cooperate in the preparation or prepare space layouts as required, to avoid conflicts and interferences with the installation of other trades in advanced stages of construction.

D. Contractor shall field verify all existing conditions prior to installation of equipment and material. It is recommended that the contractor verify all existing conditions prior to submitting a proposal. Lack of field verification does not constitute a basis for additional monies during construction. Contractor assumes full responsibility for completeness of installation including coordination of work with other trades.

1.6 PERMITS, CODES AND ORDINANCES

A. The Plumbing Contractor shall arrange and pay for all permits, inspections, etc., as required by local utilities or applicable agencies.

B. All work and material shall be in complete accordance with the ordinances, regulations, codes, etc., of all political entities exercising jurisdictions, specifically including the NYS Energy Code.

1.7 CONFLICTS

A. If, in the interpretation of contract documents, it appears that the drawings and specifications are not in agreement, the Contractor is to contact the Engineer. The Engineer shall be the final authority. Addenda supersede the provisions which they amend.

B. In the absence of a written clarification by the engineer, the Contractor must install his work in accordance with the more stringent and/or costly condition. Contractor assumes full responsibility for any and all items furnished and installed without the written approval by the Architect or Engineer. Under no circumstances will a change order be accepted for work installed that was not approved by the Architect or Engineer.

1.8 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Required Shop Drawings

SECTION	MATERIAL ITEM
220413	PENETRATION FIRESTOPPING PLUMBING
220523	VALVES
220529	HANGERS AND SUPPORTS
220548	SEISMIC RESTRAINTS
220553	PLUMBING IDENTIFICATION
220719	PIPE INSULATION
221000	PLUMBING PUMPS
221113	WATER DISTRIBUTION PIPING
221122	METERS AND GAUGES
221123	WATER DISTRIBUTION PUMPS
221124	WATER PRESSURE BOOSTER PUMPS
221310	DRAINAGE & VENT SYSTEMS
223000	WATER HEATERS
224200	PLUMBING FIXTURES

C. Product data for the following piping specialties:

1. Mechanical sleeve seals.

2. Identification materials and devices.

D. Samples of color, lettering style, and other graphic representation required for each identification material and device.

E. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for plumbing materials and equipment.

F. Coordination drawings for access panels and door locations.

G. Prepare coordination drawings according to Division 1 Section "Submittals" to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the work. Include the following:

1. Proposed locations of piping, equipment, and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.

b. Planned duct systems layout, obtain layout from HVAC (Sub) Contractor.

c. Clearances for installing and maintaining insulation.

d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

e. Equipment service connections and support details.

f. Exterior wall and foundation penetrations.

g. Fire-rated wall and floor penetrations.

h. Sizes and locations of required concrete pads and bases.

2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings, and their relationship to other penetrations and installations.

4. Reflected ceiling plans to coordinate and integrate sprinkler installations with air outlet and inlets, light fixtures, communication systems components, and other ceiling mounted items.

H. Welder certificates signed by (Sub) Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article of this Section.

I. If substitutions are proposed after the bids are received, the Contractor shall state the amount of credit to the Owner for substitution. Substitutions that are considered equal by the contractor and carried in bid without approval by the Engineer shall be the responsibility of the Contractor. The Engineer and/or Owner shall not be made liable or responsible for losses incurred by the Contractor, due to the rejection of said items for installation.

1.9 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code - Steel".

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping".

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.10 COORDINATION WITH OTHER TRADES

A. Check Division 22 drawings with all others.

B. Anticipate and avoid interferences with all other trades.

C. Take particular care to coordinate all piping, ductwork, plumbing and major electrical components above ceiling, to prevent conflict. Remove and relocate work as may be made necessary by such conflict, at no extra cost to the owner. Provide coordination drawings as described in the Submittals paragraph of this section. (Refer to Division 1 for additional requirements). Lack of coordination drawings assumes the contractor has verified and coordinated all work associated with installation.

D. Obtain decision for approval from project engineer for proposed group installation before proceeding, and for clearance in structure and finish of the building.

E. Running pipe over electrical equipment and elevator machine rooms is prohibited.

F. The Contractor to coordinate with, receive and install, Owner furnished equipment where indicated.

1.11 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 prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.12 MISCELLANEOUS SUPPORT

A. Mechanical Contractor is responsible for providing all miscellaneous support components necessary for properly supporting equipment provided by Mechanical Contractor including hangers, rods, anchors, steel, etc.

1.13 SEQUENCING AND SCHEDULING

A. Coordinate plumbing equipment installation with other building components.

B. Arrange and coordinate for chases, slots, and opening in building structure during progress of construction, to allow for plumbing installations. Coordinate with other trades.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed. Do not alter structural members, and do not over stress.

D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building. Comply with all applicable inspections required by Authority Having Jurisdiction.

E. Coordinate connection of electrical services and circuits needed.

F. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where plumbing items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors".

H. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installations of acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification sections in Division 22 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1-8-inch maximum thickness, except where 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. ASME B16.20 for grooved, ring-joint, steel flanges.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Solder Filler Metal: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.

2. Alloy Sn50: Tin (50 percent) and lead (50 percent). Drainage, Waste & Vent (DWV) copper only.

3. Alloy E: Tin (approximately 95 percent) and copper (approximately 5 percent), having 0.10 percent maximum lead content.

4. Alloy HA: Tin-antimony-silver-copper-zinc, having 0.10 percent maximum lead content.

5. Alloy HB: Tin-antimony-silver-copper-nickel, having 0.10 percent maximum lead content.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Plastic Pipe Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

G. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

H. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end, pressure pipes.

1. Sleeve: ASTM A 126. Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.

2. Outside Diameter: Completely cover opening.

3. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

4. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure, and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F. temperature.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

   a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F. temperature.

7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive, thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 deg F. temperature.

C. Mechanical Sleeve Seals: Modular, watertight, mechanical type. Components include interlocking synthetic links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

D. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 24 gauge or heavier, galvanized sheet metal, round tube closed with welding longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

   a. Penetrating Pipe Deflection: 5 percent without leakage.

   b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.

   c. Pipe Sleeve: AWWA C151, ductile-iron pipe.

   d. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.

5. Cast-Iron Sleeve Fittings: Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.

6. PE Plastic: Manufactured, reusable, tapered, cup-shaped, smooth outer surface, with nailing flanges for attaching to wooden forms.

2.4 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. Where more than single type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

2.5 GROUT

A. Non-shrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000 psi, 28-day compressive strength.

3. Packaging: Premixed and factory-packaged.

PART 3 EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general locations 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, except where deviations to layout are approved on coordination drawings.

C. Contractor is required to prime all plumbing traps with water prior to final inspections and in accordance with test procedures specified elsewhere.

D. Install piping at indicated slope.

E. Install components having pressure rating equal to or greater than system operating pressure.

F. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

G. Install piping parallel and perpendicular free of sags, deflection, and bends.

H. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated and/or approved due to conditions.

I. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal and needed access to other services. Allow for insulation thicknesses.

J. Install piping to allow application of insulation plus 1-inch clearance around insulation.

K. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

L. Install fittings for changes in direction and branch connections.

M. Install couplings according to manufacturer's printed instructions.

N. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screws, and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.

O. Sleeves are not required for core drilled holes.

P. Permanent sleeves are not required for holes formed by PE plastic (removable) sleeves.

Q. Install sleeves for piping passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated. Maintain fire assembly ratings.

R. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs, and where indicated.

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 where specified.
2. Build sleeves into new walls and slabs as work progresses.
3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    a. PVC Pipe Sleeves: For pipes smaller than 6 inches.
    b. Steel Pipe Sleeves: For pipes smaller than 6 inches.
    c. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.
4. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in Division 7 Section "Flashing and Sheet Metal".
    a. Seal space outside of sleeve fittings with non-shrink, non-metallic grout.
5. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulations, using elastomeric joint sealants in Division 7 Section "Joint Sealants".

S. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

1. Install steel pipe for sleeves smaller than 6 inches.
2. Install cast-iron wall pipes for sleeves 6 inches and larger.
3. Assemble and install mechanical seals according to manufacturer's printed instructions.

T. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron wall pipes for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeves for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

U. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

V. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 7 Section "Firestopping".

W. Verify final equipment locations for piping rough-in.

X. Refer to equipment specifications in other sections of these Specifications for roughing-in requirements.

Y. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system specification Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS "Soldering Handbook," Chapter 6 "Assembly Processes."

4. Brazed Joints: Construct joints according to AWS "Brazing Handbook, Chapter 35 "Pipe and Tubing."

5. 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 inside diameter. Join pipe fittings and valves as follows:

    a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

    b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).

    c. Align threads at point of assembly.

    d. Tighten joints with wrench. Apply wrench to valve end into which pipe is being threaded.

    e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12 "Guide for Welding Mild Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

Z. Piping Connections: Except as otherwise indicated, make piping connections as specified below:

1. Install unions in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2 inches or smaller threaded pipe connection.

2. Install flanges in piping 2-1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3. Wet Piping Systems (Water): Install dielectric couplings and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom, where mounting heights are not indicated.

B. Install equipment according to manufacturer’s installation instructions and approved submittal data. Contractor assumes full responsibility for any and all items furnished and installed without written approval by the Architect or Engineer. Under no circumstances will a change order be approved for work installed that was not approved by the Architect or Engineer. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Allow for servicing and maintenance clearances.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 LABELING AND IDENTIFYING

A. Provide labeling per Division 22 specification sections for piping and equipment identification.

3.4 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for field painting requirements.

B. Damage and Touch-Up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000 psi, 28-day compressive strength concrete and reinforcement as specified in Division 3 Section "Cast-In-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding - Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood ground, nailers, blocking, and anchorage to support and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Install nonmetallic, non-shrink, grout for plumbing equipment base baring surfaces, pump, and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions. Use proper bonding agents when necessary by differing materials/surfaces.

B. Clean surfaces that will come into contact with grout. Prep/repair if necessary.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide a smooth bearing, full contact surface for equipment.

G. Place grout tightly around anchors.

H. Cure placed grout according to manufacturer's printed instructions.

END OF SECTION 220050

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 220523

VALVES

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 general duty valves common to several mechanical piping systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Special purpose valves are specified in Division 22 piping system Sections.

2. Valve tags and charts are specified in Division 22 Section "Plumbing Identification."

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual specified in Division 1. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Comply with the requirements specified in Division 1 Section "Materials and Equipment," under "Source Limitations" Paragraph.

B. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

C. MSS Compliance: Comply with the various MSS Standard Practice Documents referenced.

D. Valves shall be compatible with the type of piping material installed in the system.

E. All domestic water valves shall meet the requirements of NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set globe and gate valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure to 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 indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in 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. Gate Valves:
   a. Hammond Valve Corporation.
   b. Milwaukee Valve Company, Inc.
   c. NIBCO Inc.
   d. Stockham Valve & Fittings, Inc.
2. Ball Valves:
   a. Conbraco Industries, Inc.; Apollo Division.
   b. NIBCO Inc.
   c. Stockham Valves & Fittings, Inc.
   d. Watts Regulator Company.
3. Swing Check Valves:
   a. Hammond Valve Corporation.
   b. Milwaukee Valve Company, Inc.
   c. NIBCO Inc.
   d. Stockham Valves & Fittings, Inc.
4. Wafer Check Valves:
   a. Hammond Valve Corporation.
   b. Milwaukee Valve Company, Inc.

c. NIBCO Inc.

d. Stockham Valves & Fittings, Inc.

5. Balancing Valves:

a. Amtrol, Inc.

b. Armstrong Pumps, Inc.

c. Bell & Gossett Div., ITT Fluid Technology Corp.

2.2 BASIC COMMON FEATURES

A. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Non-rising stem valves may be used only where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe, unless otherwise indicated.

D. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.

2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 10 plug valves.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. Threads: ASME B1.20.1.

H. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

I. Solder Joint: ASME B16.18. **Caution**: Where soldered end connections are used, use solder having a melting point below 840° F for gate, globe, and check valves; below 421° F for ball valves.

2.3 GATE VALVES

A. Gate Valves, 2-1/2 Inches and Smaller: Lead free MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

B. Gate Valves, 3 inches and Larger: Lead free MSS SP-70, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with 2-piece packing gland assembly, flanged end connections; and with cast-iron handwheel. Provide UL-listed valves meeting the above for fire protection systems.

2.4 BALL VALVES

A. Ball Valves, 4 inches and Smaller: Lead free MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and full port for 3/4-inch larger; threaded or soldered end connections:

1. Operator: Vinyl-covered steel lever handle.

2. Stem Extension: For valves installed in insulated piping.

3. Memory Stop: For operator handles.

2.5 CHECK VALVES

A. Swing Check Valves, 2-1/2 Inches and Smaller: Lead free MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections.

2.6 BALANCING VALVES

A. Balancing Valves 1-1/2 Inches and Smaller: Lead free Bronze body, brass ball construction, TFE seat ring packing, differential pressure readout ports, straight pattern, globe type for throttling, tamper-proof "memory" stop with drain-purge port. 200 psig design pressure for sweat connection, 300 psig design pressure for threaded end connections.

2.7 DRAIN VALVES

A. Ball Drain Valves: MSS SP-110, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port valves; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections: NIBCO T-585-70 HC or equal.

1. Operator: Vinyl-covered steel lever handle.

2. Stem Extension: For valves installed in insulated piping.

3. Hose thread connection and brass cap with chain.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until satisfactory conditions have been corrected.

B. 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.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

2. Wafer Check Valves: Horizontal or vertical position, between flanges.

3.3 SOLDERED CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open gate and globe valves to fully open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.

D. Assemble joints, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.5 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.6 VALVE END SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 2-1/2 Inches and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.

2. Steel Pipe Sizes, 2-1/2 Inches and Smaller: Threaded or grooved end.

3. Steel Pipe Sizes, 3 Inches and Larger: Grooved end or flanged.

3.7 APPLICATION SCHEDULE

A. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.

B. Domestic Water Systems: Use the following valve types:

1. Gate Valves: Lead free, Class 125, bronze or cast-iron body to suit piping system.

2. Ball Valve: Lead free, Class 150, 600-psi CWP, with stem extension.

3. Bronze Swing Check: Lead free, Class 125, with rubber seat.

4. Check Valves: Lead free, Class 125, swing or wafer type as indicated.

3.8 ADJUSTING

A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

3.9 VALVE SCHEDULE

Gate Valves - 2 Inch and Smaller:

	THREADED		SOLDER	
MANUFACTURER	**NRS**	**RS**	**NRS**	**RS**
Hammond	UP645	UP640	UP647	UP635
Milwaukee	UP105	UP148	UP115	UP149
NIBCO	T113-LF	T111-LF	S113-LF	S111-LF
Stockham	LFB-103	X	LFB-104	X

Gate Valves - 2-1/2 Inch and Larger (Domestic Water):

MANUFACTURER	OS & YRS	NRS
Hammond	UP105	UP115
Milwaukee	UP105	UP115
Watts	408-OSYRW	405-NRS-RW

Ball Valves - 4 Inches and Smaller:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	77FLF-100	77FLF-200
NIBCO	T-585-80-LF	S-585-80-LF
Watts	LFB-6080	LFB-6081

Swing Check Valves - 2 Inches and Smaller:

MANUFACTURER	CLASS 125 THREADED ENDS	CLASS 150 SOLDER ENDS	THREADED ENDS
NIBCO	T-413-Y-LF	S-413-Y-LF	
Watts	LFCV	x	

Swing Check Valves - 2-1/2 Inches and Larger (Domestic Water):

MANUFACTURER	CLASS 125	CLASS 175
Hammond	UP1509	UP509
Milwaukee	UP1509	UP509
NIBCO	F-918	x
Stockham	G-931	G-940

Wafer Check Valves (Domestic Water):

Bell & Gossett: NS
Center Line: CLC
Metraflex: Chexx
Mission: 12HMP
Stockham: WG970.
Victaulic: Series 710/711

x means not available.

END OF SECTION 220523

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 220529

HANGERS AND SUPPORTS

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 hangers and supports for plumbing systems piping and equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for materials attaching hangers and supports to building structure.

2. Division 22 Section "Vibration Control" for vibration-isolation hangers and supports.

1.3 DEFINITIONS

A. Terminology used in this section is defined in MSS SP-90.

1.4 PERFORMANCE REQUIREMENTS

A. Design seismic restraint hangers and supports for piping and equipment.

B. Design seismic restraint hangers and supports for piping and equipment in accordance with, and obtain approval of, the authority having jurisdiction.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's figure number, size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by the (Sub) Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article.

E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

F. Licensed Engineer's hanger and support drawings specified in the "Quality Assurance" Article.

G. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

1.6 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code - Steel." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

F. Licensed Engineer: Prepare hanger and support design drawings and calculations for seismic restraint of piping and equipment. Include seal and signature of Registered Engineer, licensed in the jurisdiction where project is located, certifying compliance with specifications.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory fabricated according to MSS SP-58.

1. Components include galvanized coatings where installed for piping and equipment that will not have field-applied finish.

2. Pipe attachments include non-metallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

D. Mechanical-Anchor Fasteners: Insert type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic.

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous, and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Water: Potable:

4. Packaging: Premixed and factory-packaged.

PART 3 EXECUTION

3.1 HANGERS AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments to support piping properly from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.

E. Support all insulated horizontal piping by means of hangers or supports with insulation shields installed outside of the insulation.

F. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

G. Install concrete inserts in new construction prior to placing concrete.

H. Install powder-actuated drive-pin fasteners 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. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install mechanical anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

J. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

K. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

L. Support fire protection systems piping independent of other piping.

M. Install hangers and supports to allow controlled 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.

N. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

P. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach oversized clamps to suit the outside diameter of the pipe insulation, including spacers (if any), to piping so clamps do not project through insulation; do not exceed pipe stresses allowed by ASME B31.9.

2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

3. Shields: Install protective shields MSS Type 40 on cold, hot, recirculated hot, and storm water piping. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

NPS	LENGTH	THICKNESS
1/4 thru 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 thru 14	24	0.075
16 thru 24	24	0.105

4. Pipes 8-inches and larger shall have wood inserts.

5. Insert material shall be at least as long as the protective shield.

6. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.3 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standard D1.1.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to control movement to compensators.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

3.4 INSTALLATION OF PIPE ALIGNMENT GUIDES

A. Install pipe alignment guides on piping that adjoins expansion joints and elsewhere as indicated.

B. Anchor to building substrate.

3.5 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for piping and equipment.

3.6 METAL FABRICATION

A. Cut, drill, fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.

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 for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and 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 that no roughness shows after finishing, and so that contours welded surfaces to match adjacent contours.

3.7 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 section "Painting" of these specifications.

D. For galvanized surfaces clean welds bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220548

SEISMIC RESTRAINTS

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 seismic restraints and snubbers for plumbing, mechanical and electrical components. It complements optional seismic construction requirements in the various component sections.

B. It is the intent of the seismic portion of this specification to keep all plumbing, mechanical, and electrical building system components in place during a seismic event.

C. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.

D. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent Building Code of New York State, national or local construction requirements (i.e. California Title 24, California OSHPD or other requirements).

E. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.

F. Seismic restraints shall be designed in accordance with seismic force levels as detailed in section 1.07.

1.3 THE WORK IN THIS SECTION INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

A. Seismic restraints for isolated equipment.

B. Seismic restraints for non-isolated equipment.

C. Certification of seismic restraint designs and installation supervision.

D. Certification of seismic attachment of housekeeping pads.

E. All plumbing, mechanical and electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included. Equipment referred to below is typical. (Equipment not listed is still included in this specification).

Tanks (All types)
Pumps (All types)

1.4 RELATED WORK

A. Housekeeping Pads

1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.

2. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.

B. Supplementary Support Steel: Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.

C. Attachments: Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps etc. as required.

1.5 SUBMITTALS

A. Professional Engineer Qualification Statement: The professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of the kind indicated. Letter to be signed and sealed by a professional engineer. (Submittal shall be rejected without qualification statement).

B. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finishes for each type of isolator and restraint. Include load deflection curves. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency approved by authorities having jurisdiction.

C. Shop Drawings: Indicate materials, and show designs and calculations, signed and sealed by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, and selection of seismic restraints and anchors. Include calculations of combined tensile and shear loads.

2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.

3. Seismic Restraint Details: Detail fabrication and attachment of restraints and snubbers for all systems including but not limited to equipment, piping, ductwork, diffusers.

4. Pre-approval and Evaluation Documentation: By an agency approved by authority having jurisdiction, showing maximum ratings of restraints and the basis for approval (tests or calculations).

5. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for all components with other systems and equipment, including seismic restraints, in the vicinity. Coordinate seismic restraints with vibration isolation and expansion compensation systems.

6. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.

7. Qualification Data: For firms and persons specified in a Quality Assurance Article.

8. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

1.6 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in accordance with State of New York Building Code and Local Codes and Ordinances and the Authority having jurisdiction.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

1.7 PROJECT CONDITIONS

A. This project is subject to the seismic bracing requirements of the Building Code of New York State, 2002 edition. The following criteria are applicable to this project.

1. Seismic Design Category (Table 1616.3(1)): [C]

2. Seismic Risk Category (Table 1604.5): [IV]

3. Site Class Category (Table 1613.2.2): [D]

4. Design Spectral Response Acceleration (S_{DS}, Section 1615.1.3): 0.198

   a. Site Coefficient (F_a, Table 1615.1.2(1)): 1.6

   b. Mapped Spectral Acceleration (S_S, Section 1615.1): [.186]

5. Seismic Importance Factor (I_P, Section 1621.1.6): [1.5]

6. Component Amplification Factor (a_P, Table 1621.3): 1.0

7. Component Response Mod. Factor (R_P, Table 1621.3):[3.0]

8. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Forces shall be calculated for the above requirements and Equation 16-67, 68, & 69 in section 1621.1.4, unless exempted by 1621.1.1.

1.8 COORDINATION

A. Coordinate layout and installation of vibration isolation and seismic-restraint devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete housekeeping and vibration isolation bases. Cast anchor-bolt inserts into base.

C. Coordinate installation of equipment supports and roof penetrations.

D. Coordinate and design all attachments with building structural system.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver strut systems, pipe hangers and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.

B. Store strut systems, pipe hangers and components in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 INSTALLATION

A. Install seismic-control products according to manufacturer's written instructions and authorities having jurisdiction.

B. Anchor interior mounts, isolators, hangers, and snubbers to vibration isolation bases. Bolt isolator base plates to structural floors as required by authorities having jurisdiction..

C. Install pipe connectors at connections for equipment supported on vibration isolators.

D. Installation of seismic restraints must not cause any change of position of equipment, piping or duct work resulting in stresses or misalignment.

E. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

F. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.

G. Coordinate work with other trades to avoid rigid contact with the building.

H. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor’s expense.

I. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor’s expense.

J. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor’s expense.

K. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:

1. Flanges of structural beams.
2. Upper truss cords in bar joist construction.
3. Cast in place inserts or wedge type drill-in concrete anchors.

L. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

M. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

N. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.

O. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.

P. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.

Q. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.

3.2 SEISMIC RESTRAINT OF PIPING

A. Seismic Restraint of Piping

1. Seismically restrain all piping listed as a, b or c below. Use specification 12 cables if isolated. Specification 12 or 13 restraints may be used on unisolated piping.
   a. Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1" (25mm) I.D. or larger.
   b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.
   c. All other piping 2 1/2" (64mm) diameter and larger.
2. Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
3. Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
5. For fuel oil and all gas piping transverse restraints must be at 20' (6m) maximum and longitudinal restraints at 40' (12m) maximum spacing.
6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" TEE or combined stresses are within allowable limits at longer distances.

7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.

8. Branch lines may not be used to restrain main lines.

9. Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.02.C.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.02.C.2 and 3.

B. All plumbing equipment shall be seismically restrained.

3.3 SEISMIC RESTRAINT EXCLUSIONS

A. A. Piping

1. Gas piping less than 1" (25mm) inside diameter.

2. Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.

3. All other piping less than 2 1/2" (64mm) inside diameter.

4. All piping suspended by individual hangers 12" (300mm) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.

5. The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

3.4 SEISMIC CONTROL

A. Vibration Isolation Bases: Mount equipment on structural-steel bases or concrete inertia bases.

B. Snubbers: Install the required number of seismic snubbers on each spring-mounted piece of equipment. Locate snubbers as close as possible to the vibration isolators and bolt to supporting structure.

3.5 ADJUSTING AND CLEANING

A. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operations.

B. Adjust thrust restraints for a maximum of 1/4 inch of movement at start and stop.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in piping where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at equipment anchored to a different mobile structural element from the one supporting them. The seismic engineer of record shall (through properly substantiated calculations) design the appropriate methods of accommodating the displacements. To accept the motion, which is usually determined from the structural engineer of record, systems can be designed by one of the following methods:

1. Design systems to have the inherent flexibility required to accept the differential motion using pipe loops and/or offsets.

2. Localize the area at which differential motion will occur by anchoring to each building and provide a set of flexible connectors arranged to accept the motion

3. Flexible connectors shall be model Seismijoint as manufactured by Southeastern Hose, Inc., or equal.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Test pull-out resistance of seismic anchorage devices.

1. Provide necessary test equipment required for reliable testing.

2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.

4. Obtain Architect's approval before transmitting test loads to the structure. Provide temporary load-spreading members.

5. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

6. Test to 90 percent of rated proof load of device.

7. If a device fails the test, modify all installations of same type and retest until satisfactory results are achieved.

8. Record test results.

9. Provide walk-through of project to verify installation in accordance with Specifications and Engineered Submittals. Submit approval letter signed and sealed from the seismic engineer of record shall for installation and completion.

END OF SECTION 220548

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 220553

PLUMBING IDENTIFICATION

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 plumbing identification materials and devices.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data for identification materials and devices including catalog sheets, specifications and installation instructions for each item specified.

C. Valve Schedules: Submit valve schedules for each piping system. Reproduce on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Furnish extra copies (in addition to mounted copies) for Maintenance Manuals as specified in Division 1 Section "Project Closeout."

1.4 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 IDENTIFYING DEVICES AND LABELS

A. General: Products specified are manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. Where more than single type is specified for listed application, selections are Installer’s option, but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate permanently fastened to equipment and having data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.

2. Location: An accessible and visible location.

C. Pipes smaller than 6 Inches including insulation: Full-band pipe markers, extending 360 degrees around pipe at each location.

D. Pressure-Sensitive Pipe Markers: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flow arrow banding tape is not being used.

E. Lettering: Manufacturer's standard pre-printed terms which best describe each piping system, or as selected by Architect/Engineer in cases of variance with name as specified.

F. Lettering: Use piping system terms as indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering (to accommodate both directions), or as separate unit, on each pipe marker to indicate direction of flow.

2. Pipe Marker Legend and Color Field Sizes:

OD of Pipe or Insulation (Inches)	Letter Size (Inches)	Length of Color Field (Inches)
3/4 to 1-1/4 incl.	1/2	8
1-1/2 to 2 incl.	3/4	8
2-1/2 to 6 incl.	1-1/4	12

G. Plastic Tape: Manufacturer's standard color-coded, pressure- sensitive, self-adhesive, vinyl tape, at least 3-mils thick.

1. Width: 1-1/2 inches wide on pipes with outside diameters (including insulation) less than 6 inches; 2-1/2 inches wide for larger pipes.

2. Color: Comply with ASME A13.1, except where another color selection is indicated.

H. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

I. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Provide a 5/32- inch hole for fastener.

1. Material: 19 gauge polished brass

2. Size: 1-1/2 inches diameter, except as otherwise indicated

J. Valve Tag Fasteners: Brass chain (wire link or beaded type) or brass S-hooks.

K. Access Panel Markers: 1/16-inch-thick engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch center hole for attachment.

L. Valve Schedule Frames: Glazed display frame, with screws for removable mounting on masonry walls for each page of valve schedule, sized to fit 8-1/2x11 inches valve chart.

1. Frame: extruded aluminum

2. Glazing: ASTME C 1036, 2.5 mm, single thickness, sheet glass

a. Type: Type I, flat transparent

b. Class: Class1, clear

c. Quality: Glazing B, for general applications

M. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine subcore, except when other colors are indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraved with engraver’s standard letter style, of sizes and with terms to match equipment identification.

2. Thickness: 1/16 inch for units up to 20 square inches or 8 inches length; 1/8 inch for larger units.

3. Fasteners: Self-tapping stainless steel screws or contact-type permanent adhesive.

N. Plastic Equipment Markers: Laminated-plastic, in manufacturer's standard color code, unless otherwise indicated.

1. For hazardous equipment, use colors and designs recommended by ASME A13.1

2. Terminology: Include following, matching schedules as closely as possible:

a. Name and plan number

b. Equipment service

c. Design capacity

d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

3. Size: Approximate 2-1/2 x 4 inches for valves; 4-1/2 x 6 inches for equipment.

O. Plasticized Tags: Pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing.

1. Size: Approximately 3-1/4 x 5-5/8 inches.

2. Fasteners: Brass grommets and wire.

3. Nomenclature: Large-size primary wording such as “DANGER”, “CAUTION”, or “DO NOT OPERATE”.

P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in plumbing identification, with corresponding designations indicated. Use numbers, letters, and

terms indicated for proper identification, operation, and maintenance of plumbing systems and equipment. Multiple Systems: Where multiple systems of same name are indicated, identify individual system number as well as service (such as Water Heater No.3, Air Compressor No.1A, or Standpipe F12).

PART 3 EXECUTION

3.1 PREPARATION

A. Complete testing, insulation and finish painting Work prior to completing the Work of this Section.

B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.

3.2 INSTALLATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

B. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

C. Plastic markers, with application systems.

1. Fasten markers on pipes smaller than 6 inches including insulation where applicable by one of following methods:
    a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
    b. Adhesive lap joint in pipe marker overlap.
    c. Laminated or bonded application of pipe marker to pipe (or insulation).
    d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4-inch wide, lapped 1-1/2 inches minimum at both ends of pipe marker, and covering full circumference of pipe.
2. Fasten markers on pipes 6 inches and larger by one of following methods:
    a. Laminated or bonded application of pipe marker to pipe (or insulation).
    b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2-inches wide, lapped 3 inches minimum at both ends of pipe marker, and covering full circumference of pipe.
    c. Strapped to pipe (or insulation) with manufacturer's standard stainless steel bands.

D. Stick-On Pipe Markers:

1. Install minimum of 2 markers at each specified location, 90 degrees apart on visible side of pipe.
2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.

E. Locate pipe markers and color bands as follows wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

1. Near each valve and control device.

2. Near each branch connection, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.

3. Near penetrations through walls, floors, ceilings, or enter non-accessible 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 a maximum of 50-feet intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.

7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

F. Valve Tags: Install valve tag on valves and control devices in piping systems, except check valves, valves within factory- fabricated equipment units, plumbing fixture supply stops, faucets, convenience and lawn-watering hose bibbs, and rough-in connections of end-use fixtures and units. List tagged valves in valve schedule. Install mounted valve schedule in each major equipment room.

G. Equipment: Install engraved plastic laminate signs or equipment markers on or near each major item of plumbing equipment. Provide signs for following general categories of equipment:

1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.

2. Meters, gages, thermometers, and similar units.

3. Fuel-burning units including water heaters, stills, etc.

4. Pumps, compressors, and similar motor- driven units.

5. Heat exchangers, and similar equipment.

6. Tanks and pressure vessels.

7. Strainers, filters, water treatment systems, and similar equipment.

H. Plasticized Tags: Install within concealed space to reduce amount of text in exposed sign (outside concealment), where equipment to be identified is concealed above acoustical ceiling or similar concealment. Identify operational valves and similar minor equipment items located in unoccupied spaces (including machine rooms) by installing plasticized tags.

3.3 ADJUSTING AND CLEANING

A. Relocate plumbing identification materials and devices which have become visually blocked by work of this Division or other Divisions.

B. Clean face of identification devices and glass frames of valve charts.

3.4 PIPING IDENTIFICATION SCHEDULE

A. Piping Identification Types:

1. Piping or Insulation under 5-7/8 inch od: Pipe identification tags.
2. Piping or Insulation 3/4 inch to 5-7/8 inch od: Snap-on marker or stick-on marker.
3. Piping or Insulation 6 inch od and Larger: Strap-on marker or stick-on marker.

B. Identify exposed piping, bare or insulated, as to content, size of pipe and direction of flow, with the following exceptions:

1. Piping in furred spaces or suspended ceilings, except at valve access panels where valves and piping shall be identified as specified for exposed piping systems.
2. Piping in finished spaces such as offices, class rooms, wards, toilet rooms, shower rooms and spaces as specified.

C. Locate piping identification to be visible from exposed points of observation. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs. Where 2 or more pipes run in parallel, place the printed legend and other markers in the same relative location.

3.5 VALVE IDENTIFICATION SCHEDULE

A. Tag valves according to size, shape, color scheme, and with captions to clearly and concisely indicate piping system and valve function.

B. Valve Service Identification Charts:

1. Provide 2 framed valve charts for each piping system specified to be provided with valve identification tags. Type charts on 8-1/2 x 11 inches heavy white bond paper, indicating valve number, service and location.
2. Hang framed charts at locations as directed.

END OF SECTION 220553

SECTION 220700

PLUMBING INSULATION

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 pipe, and equipment insulation.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 22 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal Resistivity: "r-values" represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.

E. R-Value: Insulation thicknesses shall be based on insulation having an R-value in the range of a minimum R-4.0 to R-4.6 per inch of insulation.

F. Density: Is expressed in lb/sq.ft.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of plumbing insulation identifying k-value, thickness, and accessories.

C. Material test reports prepared by a qualified independent testing laboratory. Certify insulation meets specified requirements.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in 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. Glass Fiber:

a. CertainTeed Corporation.

b. Knauf Fiberglass GmbH.

c. Owens-Corning Fiberglas Corporation.

d. Schuller International, Inc.

e. USG Interiors, Inc. - Thermafiber Division.

2. Cellular Glass:

a. Pittsburg Corning Corporation.

3. Flexible Elastomeric Cellular:

a. Armstrong World Industries, Inc.

b. Halstead Industrial Products.

c. IMCOA.

d. Rubatex Corporation.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber- reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity Per Inch: 0.25 average maximum, at 75 deg F mean temperature.

2. Density: 12 pcf average maximum.

D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.

1. Thermal Conductivity per Inch: 0.32 average maximum, at 75 deg F mean temperature.

E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

1. Thermal Conductivity per Inch: 0.25 average maximum at 75 deg F mean temperature.

2. Density: 10 average maximum.

F. Adhesive: Produced under the UL Classification and Follow-up service.

1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 to 180 deg F.

G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 CELLULAR GLASS

A. Material: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

B. Facing: ASTM C 921, Type 1, factory-applied, laminated foil, flame- retardant, vinyl facing.

C. Form: The following as indicated:

1. Blocks: ASTM C 552, Type I.

2. Boards: ASTM C 552, Type IV.

3. Preformed Pipe: ASTM C 552, Type II, Class 2 (jacketed).

4. Special Shapes: ASTM C 552, Type III, in shapes and thicknesses as indicated.

D. Thermal Conductivity Per Inch: 0.38 average maximum at 75 deg F mean temperature.

E. Minimum Density: 7 pcf.

F. Maximum Density: 9.5 pcf.

2.4 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

1. Tubular Materials: ASTM C 534, Type I.

2. Sheet Materials: ASTM C 534, Type II.

B. Thermal Conductivity Per Inch: 0.30 average maximum at 75 deg F.

C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.5 INSULATING CEMENTS

A. Mineral Fiber: ASTM C 195.

1. Thermal Conductivity: 1.0 average maximum at 500 deg F mean temperature.

2. Compressive Strength: 10 psi at 5 percent deformation.

B. Expanded or Exfoliated Vermiculite: ASTM C 196.

1. Thermal Conductivity: 1.10 average maximum at 500 deg F mean temperature.

2. Compressive Strength: 5 psi at 5 percent deformation.

C. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

1. Thermal Conductivity: 1.2 average maximum at 400 deg F mean temperature.

2. Compressive Strength: 100 psi at 5 percent deformation.

2.6 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.7 JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.

1. Adhesive: As recommended by insulation manufacturer.

C. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

D. ACCESSORIES AND ATTACHMENTS

E. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd.

1. Tape Width: 4 inches.

2. Cloth Standard: MIL-C-20079H, Type I.

3. Tape Standard: MIL-C-20079H, Type II.

F. Bands: 3/4-inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: Type 304, 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.

3. Aluminum: 0.007 inch thick.

4. Brass: 0.01 inch thick.

5. Nickel-Copper Alloy: 0.005 inch thick.

G. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.

H. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch kraft paper.

I. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.8 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition. Water Vapor Permeance: 0.08 perm maximum.

B. Temperature Range: Minus 20 to 180 deg F.Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum.

2. Temperature Range: Minus 50 to 250 deg F.

3. Color: Aluminum.

PART 3 EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.

1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each plumbing system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, and equipment having surface operating temperatures below 60 deg F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage- per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors for pipes.
2. Vibration control devices.
3. Testing laboratory labels and stamps.
4. Nameplates and data plates.
5. Fire protection piping systems.
6. Sanitary drainage and vent piping.
7. Drainage piping located in crawl spaces, unless indicated otherwise.
8. Below grade piping.
9. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
10. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously through hangers and supports, over fittings, valves, and specialties, except as otherwise indicated.

D. Direct hanger or clamp contact of pipe for insulated hot or cold piping is not allowed.

E. Apply insulation with a minimum number of joints.

F. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply 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 on center.

    a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

G. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

H. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.

I. Exterior Wall Penetrations: For penetrations of below grade exterior walls, extend metal jacket for exterior insulation through penetration to a point 2 inches from interior surface of wall inside the building. Seal ends of metal jacket with vapor barrier coating. Secure metal jacket ends with metal band. At point where insulation metal jacket contacts mechanical sleeve seal, insert cellular glass preformed pipe insulation to allow sleeve seal tightening against metal jacket. Tighten and seal sleeve to jacket to form a watertight seal.

J. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer. Refer to Division 7 Section "Joint Sealants."

K. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer. Refer to Division 7 for firestopping and fire-resistant joint sealers.

L. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.

M. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.

5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

7. Cover insulation, except for metal jacketed insulation, with 2 layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.

N. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 22 Section "Hangers and Supports." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.

1. Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 GLASS FIBER PIPE INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.5 CELLULAR GLASS PIPE INSULATION INSTALLATION

A. Cellular Glass Insulation: Join sections of cellular glass insulation with vapor barrier compound. Secure insulation with manufacturer's recommended adhesive. Seal joints with manufacturer's recommended joint sealer.

1. Multiple Layer Installations: Stagger joints of multilayer installations. Secure inner layer with glass fiber reinforced tape. Secure outer layers with 2 metal bands for each insulation section.

2. Finishing: Apply manufacturer's recommended weather barrier mastic.

3. Finishing: Apply metal jacket over manufacturer's recommended vapor barrier mastic.

3.6 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

1. Miter cut materials to cover soldered elbows and tees.

2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.7 EQUIPMENT INSULATION INSTALLATION, GENERAL

A. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.

B. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.

C. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.

D. Bevel insulation edges for cylindrical surfaces for tight joint.

E. Secure sections of insulation in place with wire or bands spaced at 9-inch centers, except for flexible elastomeric cellular insulation.

F. Protect exposed corners with corner angles under wires and bands.

G. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

H. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.

I. Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.8 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with anchor pins and speed washers.

B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

C. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.9 CELLULAR GLASS EQUIPMENT INSULATION INSTALLATION

A. Join sections of insulation with vapor barrier compound.

B. Secure insulation with manufacturer's recommended adhesive. Seal joints with manufacturer's recommended joint sealer.

C. Secure inner layer of multiple layer installations with glass fiber reinforced tape. Secure outer layers with 2 metal bands for each insulation section.

3.10 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

A. Install sheets of the largest manageable size.
B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.
C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.11 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at

longitudinal joints and 3-inch-wide butt strips at end joints. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.

B. Interior Exposed Insulation: Install continuous stainless-steel jackets.

C. Interior Exposed Insulation: Install continuous aluminum jackets.

D. Interior Exposed Insulation: Install continuous PVC jackets.

E. Interior Exposed Insulation: Install continuous glass cloth jackets.

F. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.

G. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16-inch-thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.12 FINISHES

A. Paint finished insulation as specified in Division 9 Section "Painting."

B. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.13 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:

1. Domestic cold water.
2. Domestic hot water.
3. Recirculated hot water.
4. Tempered water.
5. Sanitary drains for fixtures accessible to the disabled.

C. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:

1. Domestic cold water.
2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
3. Domestic hot water.
4. Recirculated hot water.
5. Tempered water.

D. Equipment: Unless otherwise indicated, insulate the following indoor equipment:

1. Domestic hot water equipment, tanks, and water heaters.

2. High temperature water equipment, tanks, pumps, and heat exchangers, 250 deg F to 350 deg F.
3. Refrigerated drinking water equipment, tanks, pumps, and heat exchangers.

3.14 PIPE INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:

1. Field-Applied Jackets: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.
2. Pipe Sizes: NPS - Nominal Pipe Size.

3.15 EQUIPMENT INSULATION SCHEDULES

INTERIOR EXPOSED DOMESTIC COLD WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
GLASS FIBER	BLOCK OR BOARD	1	YES	(P)(K)(A)(SS)
CELLULAR GLASS	BLOCK	1-1/2	YES	(P)(K)(A)(SS)
FLEXIBLE ELASTOMERIC	SHEET	3/4	YES	NONE

INTERIOR EXPOSED DOMESTIC HOT WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
GLASS FIBER	BLOCK	2	NO	(A)(SS)
CELLULAR GLASS	BLOCK	2	NO	(A)(SS)
CALCIUM SILICATE	BLOCK	2	NO	(A)(SS)

INTERIOR DOMESTIC COLD WATER

INSULATION SCHEDULE

Insulating materials and thickness for piping, equipment, vessels and appurtenances for conveying, storing or processing materials. Thicknesses listed are minimum (Nominal).

PIPE SIZES (NPS)	MATERIAL OPTIONS	VAPOR BARRIER	INSULATION THICKNESS (Inches)
1/2 to 1"	Fibrous Glass	Yes	1"
1-1/4" and up	Fibrous Glass	Yes	1"

100°F TO 139°F
INTERIOR DOMESTIC HOT WATER & RECIRCULATION HOT WATER

INSULATION SCHEDULE
Insulating materials and thickness for piping, equipment, vessels and appurtenances for conveying, storing or processing materials. Thicknesses listed are minimum (Nominal).

PIPE SIZES (NPS)	MATERIAL OPTIONS	VAPOR BARRIER	INSULATION THICKNESS (Inches)
1/2 to 1-1/4”	Fibrous Glass	Yes	1”
1-1/2” and up	Fibrous Glass	Yes	1-1/2”

END OF SECTION 220700

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 1 Specification Sections, apply to this Section.

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. This section includes general requirements that apply to implementation of the commissioning process without regard to specific systems, assemblies, and components.

B. Related Sections including the following:

1. Division 23 Section “Commissioning of HVAC” for commissioning process activities for HVAC systems, assemblies, equipment, and components.

2. Division 26 Section “Commissioning of Electrical” for commissioning process activities for electrical systems, assemblies, equipment and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document, prepared by Architect, that record concepts, calculations, decisions, and product selection used to meet the OPR and to satisfy applicable regulator requirements, standard and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner’s Project Requirements. A document, prepared by Owner that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Assemblies, Equipment and Components: Where these terms are used together or separately, they shall mean “as-built” systems, assemblies, equipment and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to,

representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.

2. Representatives of the facility user and operation and maintenance personnel.

3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documents to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S REPSONSIBILITIES

A. Contractor and their subcontractors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

2. Cooperate with the CxA for resolution of issues recorded in "Issues Log."

3. Attend and participate in commissioning team meetings held on a variable basis.

4. Integrate and coordinate commissioning process activities with construction schedule.

5. Review and accept construction checklist provided by the commissioning authority.

6. Complete paper or electronic construction checklists as Work is completed and provide to the commissioning authority on a monthly basis.

7. Review and accept commissioning process test procedures provided by the commissioning authority.

8. Accomplish commissioning process test procedures.

1.7 CXA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, CxA will report the failure in the "Issue Log."

F. Prepare and maintain issues log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning process report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

A. Systems to be commissioned shall include, but not limited to the following systems and equipment. Contractor shall coordinate with the commissioning agents Cx plan for a complete list of systems and equipment.

1. Service Water Heating and Domestic Hot Water systems including, but not limited to:
    a. Water Heaters
    b. Recirculating pumps
    c. Faucets
    d. HWR Balancing Stations
2. Domestic water system pressure booster pumps.
3. Fire Protection Systems

END OF SECTION 220800

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 221000

PLUMBING PUMPS

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 types of plumbing pumps:

1. Submersible sump pumps.

B. Requirements of the following Division 22 Sections apply to this section:

1. "Basic Plumbing Requirements."
2. "Common Work Results for Plumbing."
3. "Basic Piping Materials and Methods."

C. Related Sections: The following sections contain requirements that relate to this section:

1. Division 3 Section "Concrete Work" for specifications on concrete and reinforcing materials and concrete placing requirements for equipment pads.
2. Division 22 Section “Vibration Control" for inertia pads, isolation pads, spring supports, and spring hangers.
3. Division 22 Section "Fire Pumps" for horizontal and vertical, engine-driven pumps for fire protection system application.
4. Division 22 Section "Water Pressure Booster Systems" for variable-speed-drive and constant-speed, multiple-pump systems to maintain system pressures.
5. Division 22 Section "HVAC Pumps" for hydronic system centrifugal pumps.
6. Division 26 Section "Electrical Connections for Equipment" for power-supply wiring including field-installed disconnects and required electrical devices.
7. Division 26 Section "Motor Controllers" for field-installed, a.c. motor controllers.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories, plus installation and start-up instructions.

C. Shop drawings showing layout and connections for plumbing pumps. Include setting drawings with templates, and directions for installation of foundation bolts, anchor bolts, and other anchorages.

D. Wiring diagrams detailing wiring for power, signal, and control systems; differentiating between manufacturer-installed wiring and field-installed wiring.

E. Maintenance data for plumbing pumps, for inclusion in Operating and Maintenance Manuals specified in Division 1 and Division 22 Section "Basic Mechanical Requirements."

1.4 QUALITY ASSURANCE

A. Hydraulic Institute Compliance: Design, manufacture, and install plumbing pumps in accordance with "Hydraulic Institute Standards."

B. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."

C. UL Compliance: Plumbing pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."

D. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.

E. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.

F. Single-Source Responsibility: Obtain plumbing pumps of the same type from a single manufacturer.

G. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of plumbing pumps and are based on the specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Architect. The burden of proof for equality of plumbing pumps is on the proposer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

D. For extended storage times (greater than 5 days), dry internal parts with hot air or a vacuum-producing device. After drying, coat internal parts with light oil, kerosene, or antifreeze. Dismantle bearings and couplings, dry and coat with an acid-free, heavy oil, and tag and store in dry location.

E. Comply with manufacturer's rigging instructions for handling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Duplex Sump Pumps – see schedule on drawings:

2.2 PUMPS, GENERAL

A. Pumps and circulators: factory assembled and factory tested.

B. Preparation for shipping: After assembly and testing, clean flanges and exposed machined metal surfaces and treat with an anticorrosion compound. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

C. Motors: Conform to NEMA standards; single, multiple, or variable speed with type of enclosure and electrical characteristics as indicated; have built-in thermal-overload protection and grease-lubricated ball bearings. Select motors that are nonoverloading within the full range of the pump performance curve.

D. Apply factory finish paint to assembled, tested units prior to shipping.

2.3 SUBMERSIBLE SUMP PUMPS

A. General Description: Pumps shall be duplex, vertical, suspended, centrifugal, separately coupled, end suction, single stage, bronze fitted, complete with integral inlet strainer, operating controls, and sump cover.

B. Casing: Cast iron with integral cast-iron inlet strainer.

C. Impeller: Statically and dynamically balanced, open or semiopen, overhung, single suction; fabricated from cast bronze conforming to ASTM B 584, keyed to shaft and secured by a locking capscrew.

D. Pump Shaft and Sleeve Bearings: Stainless-steel shaft with bronze sleeve. Thrust bearings shall be grease-lubricated ball bearings.

E. Pump and Motor Shaft Couplings: Flexible; capable of absorbing torsional vibration and shaft misalignment.

F. Seals: Stuffing box consisting of a minimum of 4 rings of graphite-impregnated braided yarn with a bronze lantern ring between center 2 graphite rings and a bronze packing gland.

G. Seals: Mechanical seals consisting of carbon steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.

H. Motor: Vertically mounted on cast-iron pedestal.

I. Basin: Concrete with heavy duty cover.

J. Cover: Cast-iron, square cover, access opening and openings for pump shaft, control rod, and discharge piping.

K. Controls: NEMA 1, motor-mounted float switch complete with float, float rod, and rod buttons.

L. Controls: NEMA 1, motor-mounted float switch complete with float, float rod, and rod buttons. Automatic alternator shall alternate operation to units on successive cycles and operate both units when one unit cannot handle the load.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present, for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in for plumbing piping systems to verify actual locations of piping connections prior to installation.

3.2 EQUIPMENT BASES

A. Construct concrete equipment pads as follows:

1. Form concrete pads by using framing lumber with form release compounds. Chamfer top edge and corners of pad.

2. Install reinforcing bars, tied to frame, and place anchor bolts and sleeves using manufacturer's installation template.

3. Place concrete and allow to cure before installation of pumps. Use Portland Cement conforming to ASTM C 150, 4,000 psi compressive strength, and normal weight aggregate.

3.3 INSTALLATION

A. General: Comply with the manufacturer's written installation and alignment instructions.

B. Install pumps in locations and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support pumps and piping separately so that the weight of the piping system does not rest on the pump.

D. Basins: Install sump pump basins in indicated locations and connect to drainage lines. Brace interior of basin in accordance with manufacturer's instructions to prevent distortion or collapse during concrete placement. Refer to Division 3 for concrete work. Set cover over basin and fasten to top flange of basin. Install so cover is flush with finished floor.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundations, after grout has been set and foundations bolts have been tightened, and after piping connections have been made.

1. Adjust alignment of pump and motor shafts for angular and parallel alignment by one of the two methods specified in the Hydraulic Institute "Centrifugal Pumps - Instructions for Installation, Operation and Maintenance."

B. After alignment is correct, tighten the foundation bolts evenly but not too firmly. Fill the base plate completely with nonshrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has cured, fully tighten foundation bolts.

1. Alignment tolerances shall meet manufacturers recommendations.

3.5 CONNECTIONS

A. General: Install valves that are same size as the piping connecting the pump.

B. Install suction and discharge pipe sizes equal to or greater than the diameter of the pump nozzles.

C. Install a nonslam check valve and globe valve on the discharge side of pumps.

D. Electrical wiring and connections are specified in Division 26 sections.

E. Control wiring and connections are specified in other Division 22 sections.

3.6 FIELD QUALITY CONTROL

A. Check suction lines connections for tightness to avoid drawing air into the pump.

3.7 COMMISSIONING

A. Final Checks Before Start-Up: Perform the following preventative maintenance operations and checks before start-up:

1. Lubricate oil-lubricated bearings.

2. Remove grease-lubricated bearing covers and flush the bearings with kerosene and thoroughly clean. Fill with new lubricant in accordance with the manufacturer's recommendations.

3. Disconnect coupling and check motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that pump is free to rotate by hand. For pumps handling hot liquids, pump shall be free to rotate with the pump hot and cold. If the pump is bound or even drags slightly, do not operate the pump until the cause of the trouble is determined and corrected.

B. Starting procedure for pumps with shutoff power not exceeding the safe motor power:

1. Prime the pump, opening the suction valve, closing the drains, and prepare the pump for operation.

2. Open the valve in the cooling water supply to the bearings where applicable.

3. Open the cooling water supply valve if the stuffing boxes are water cooled.

4. Open the sealing liquid supply valve if the pump is so fitted.

5. Open the warm-up valve of a pump handling hot liquids if the pump is not normally kept at operating temperature.

6. Open the recirculating line valve if the pump should not be operated against dead shutoff.

7. Start motor.

8. Open the discharge valve slowly.

9. Observe the leakage from the stuffing boxes and adjust the sealing liquid valve for proper flow to ensure the lubrication of the packing. Do not tighten the gland immediately, but let the packing run in before reducing the leakage through the stuffing boxes.

10. Check the general mechanical operation of the pump and motor.

11. Close the recirculating line valve once there is sufficient flow through the pump to prevent overheating.

C. If the pump is to be started against a closed check valve with the discharge gate valve open, the steps are the same except that the discharge gate valve is opened some time before the motor is started.

END OF SECTION 221000

SECTION 221113

WATER DISTRIBUTION PIPING

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 potable cold water, hot water, and circulation hot water piping, fittings, and specialties within the building to a point 5 feet outside the building.

B. Related Sections: The following Sections contain requirements that relate to this section.

1. Division 2 Section "Potable Water Systems" for water service piping (which connects the "Water Distribution Piping" to wells and public utilities).
2. Division 2 Section "Earthwork" for trenching and backfilling materials and methods for underground piping installations.
3. Division 7 Section "Joint Sealers" for materials and methods for sealing pipe penetrations through basement walls and fire and smoke barriers.
4. Division 22 Section "Valves."
5. Division 22 Section "Meters and Gages" for thermometers and pressure gages.
6. Division 22 Section "Plumbing Identification" for labeling and identification of piping system.
7. Division 22 Section "Plumbing Pumps" for pressure booster systems, circulators, circulation pumps, motors, and accessories.

1.3 DEFINITIONS

A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.

B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.

C. Pipe sizes used in this Specification are nominal pipe size (NPS).

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each piping specialty and valve specified.

C. Welder Certificates signed by (Sub)Contractor certifying that welders comply with requirements specified in "Quality Assurance" Article.

D. Certification of Compliance with ASME and UL fabrication requirements specified below.

1. Test reports specified in Part 3 of this Section.

2. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 22 Section - "Basic Mechanical Requirements."

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with the provisions of the following codes:

1. ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

2. ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications" for Qualifications for Welding Processes and Operators.

3. New York State Department of Health "Public Water Supply Guide for Cross Connection Control" for installation of backflow prevention devices.

4. Federal Public Law 111–380 ANSI 372 to amend the Safe Drinking Water Act to reduce lead in drinking water. ‘‘(B) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pipe in a manner to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the size and location of concrete equipment pads. Cast anchor-bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate the installation of pipe sleeves for foundation wall penetrations.

1.8 EXTRA MATERIALS

A. Maintenance Stock: Furnish one valve key for each key-operated wall hydrant, hose bibb, fixture supply, or faucet installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in 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. Balancing Valves:
   a. Nibco, Inc.
   b. Bell & Gossett
2. Hose Bibbs:
   a. Lee Brass Co.
   b. Mansfield Plumbing Products.
   c. Nibco, Inc.
   d. Watts Regulator Co.
3. Wall Hydrants:
   a. Josam Co.
   b. Smith (Jay R.) Mfg. Co.
   c. Wade Div., Tyler Pipe
   d. Zurn Industries Inc., Hydromechanics Div.
4. Backflow Preventers:
   a. Cla-Val Co.
   b. Conbraco Industries, Inc.
   c. Febco.
   d. Hersey Products, Inc.
   e. Watts Regulator Co.
   f. Zurn Industries Inc. Wilkins Regulator Div.
5. Pressure-Regulating Valves:
   a. Cash (A. W.) Valve Mfg. Corp.
   b. Cla-Val Co.
   c. Spence Engineering Co., Inc.
   d. Watts Regulator Co.
   e. Zurn Industries Inc., Wilkins Regulator Div.
6. Water Meters:
   a. Badger Meter, Inc.
   b. Hays Div., Romac Industries.

c. Hersey Products, Inc.

d. Neptune Water Meter Co.; Subs. Neptune Intl. Corp.

e. Rockwell Intl.; Measurement & Flow Control Div.

7. Relief Valves:

a. Cash (A. W.) Valve Mfg. Corp.

b. Conbraco Industries, Inc.

c. Watts Regulator Co.

d. Zurn Industries, Inc. Wilkins Regulator Div.

8. Water Hammer Arresters:

a. Amtrol, Inc.

b. Ancon, Inc.

c. Josam Co.

d. Precision Plumbing Products, Inc.

e. Smith (Jay R.) Mfg. Co.

f. Wade Div., Tyler Pipe.

g. Watts Regulator Co.

h. Zurn Industries, Inc.; Hydromechanics Div.

9. Thermostatic Mixing Valves:

a. Bradley Corporation

b. Leonard Valve Co.

c. Powers Control Corp.

d. Symmons Industries Inc.

10. Press Fittings For Copper Pipe:

a. Viega Corp., Rigid Tool Co.

b. Nibco

11. Mechanical Couplings and Fittings For Grooved-End Steel Pipe:

a. Grinnell Corp.

b. Gustin-Bacon Div., Tyler Pipe

c. Stockham Valves & Fittings, Inc.

d. Victaulic Co. of America.

12. Mechanical Couplings and Fittings For Grooved-End Copper Tube:

a. Victaulic Co. of America.

13. Vacuum Breakers For Hose Connections:

a. Cash (A.W.) Valve Mfg. Corp.

b. Conbraco Industries, Inc.

c. Watts Regulator Co.

2.2 PIPE AND TUBE MATERIALS, GENERAL

A. Pipe and Tube: Refer to Part 3, Article "Application, General," for identification of systems where the below materials are used.

1. Copper Tube: ASTM B 88, Type L Water Tube, drawn temper.

2. Copper Tube: ASTM B 88, Type K Water Tube, annealed temper.

3. Steel Pipe: ASTM A 53, schedule 40, seamless, galvanized, plain ends.

4. Ductile-Iron Pipe: AWWA C151 or AWWA C115 ductile-iron pipe, with AWWA C104 cement-mortar lining.

2.3 FITTINGS

A. Wrought Copper Solder-Joint Fittings: ANSI B16.22, streamlined pattern.

B. Wrought Copper and Bronze Grooved-End Fittings: ASTM B 75 Tube and ASTM B 584 Bronze Castings.

C. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

1. Copper Press Fittings Manufacturer: Viega Corporation, Rigid Tool Co., Nibco

D. Galvanized Cast-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ASME B1.20.1.

E. Ductile-Iron Gasketed Fittings: AWWA C110 or AWWA C153, 150 psi rating, with cement mortar lining and AWWA C111 rubber gaskets.

F. Grooved-End Mechanical Fittings: ASTM A 47, ASTM A 106, or A 536, galvanized fittings with grooves or shoulders designed to accept grooved-end couplings.

G. Mechanical Couplings For Grooved-End Piping: Ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design, with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe or tube and fittings. Couplings for use with AWWA Dimension piping shall conform to AWWA C606.

H. Cast-Iron Threaded Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.

I. Bronze Flanges: ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.

J. Unions: ASME B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.

K. Dielectric Unions: Threaded, solder, or grooved-end connections as required to suit application; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

L. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze wire reinforced protective jacket; minimum 150 psig working pressure, maximum 250 deg F operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment.

2.4 JOINING MATERIALS

A. Solder Filler Metal: ASTM B 32, 95-5 Tin-Antimony.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and design temperatures and pressures.

2.5 GENERAL-DUTY VALVES

A. General-duty valves (i.e., gate, globe, check, ball, and butterfly valves) are specified in Division 22 Section "Valves." Special duty valves are specified below by their generic name; refer to Part 3 Article "Valve Application" for specific uses and applications for each valve specified.

2.6 SPECIAL DUTY VALVES

A. Balance Valves - 1-1/4" and smaller: Bronze body, brass ball construction, TFE seat ring packing, differential pressure readout ports, straight pattern, globe type for throttling, tamper-proof "memory" stop with drain-purge port. 230 psig for threaded fitting 200 psig for sweat connection.

2.7 THERMOSTATIC MIXING VALVE ASSEMBLY

A. General: See Schedule on contract drawings for details.

2.8 PIPING SPECIALTIES

A. Water Hammer Arresters: Bellows type, with stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.

B. Basket Strainers: Cast-iron body, 125 psi flanges, bolted-type or yoke-type cover with removable noncorrosive perforated strainer basket having 1/8-inch perforations and lift-out handle.

C. Hose Connections: Hose connections shall have garden hose thread outlets conforming to ASME B1.20.7.

1. Hose Bibbs: Lead free bronze body, renewable composition disc, tee handle, 1/2- or 3/4-inch solder inlet, hose outlet.

2. Hose Bibbs: Lead free bronze body with chrome- or nickel-plated finish, with renewable composition disc, wheel handle, 1/2- or 3/4-inch solder inlet, hose outlet.

3. Hose Bibbs: Lead free bronze body with chrome- or nickel-plated finish, with renewable composition disc, wheel handle, 1/2- or 3/4-inch solder inlet, hose outlet.

D. Recessed Nonfreeze Wall Hydrants: Cast-bronze box, with chrome-plated face, tee handle key, vacuum breaker, hinged locking cover, 3/4-inch inlet, and hose outlet. Lead free bronze casing shall be length to suit wall thickness.

E. Vacuum Breakers: Hose connection vacuum breakers shall conform to ASSE Standard 1011, with finish to match hose connection.

F. Backflow Preventers: (Reduced-pressure-principle) assembly consisting of shutoff valves full flow resilient seat on inlet and outlet and strainer on inlet. Assemblies shall include test cocks

(and pressure-differential relief valve) located between 2 positive seating check valves and comply with requirements of ASSE Standard 1013.

G. Pressure-Regulating Valves: Single-seated, direct-operated type, having bronze body with integral strainer and complying with requirements of ASSE Standard 1003. Select proper size for maximum flow rate and inlet and outlet pressures indicated.

H. Relief Valves: Sizes for relief valves shall be in accordance with ASME Boiler and Pressure Vessel Codes for indicated capacity of the appliance for which installed.

I. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Temperature relief valves shall be factory set at 210 deg F, and pressure relief at 150 psi.

2.9 WATER METER

A. General: Provide water meters with registration in gallons.

1. Water Meter - 2 Inches and Smaller: Disc type conforming to AWWA C700.

B. Remote Registration System: Utility company standards.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine rough-in requirements for plumbing fixtures and other equipment with water connections to verify actual locations of piping connections prior to installation.

3.2 PIPE APPLICATIONS

A. Install Type L, drawn copper tube with wrought copper fittings and solder joints for pipe sizes 4 inches and smaller, above ground, within building. Install Type K, annealed temper copper tube for pipe sizes 2 inches and smaller, with minimum number of joints, below ground.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and branch connections.

C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.

I. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inches shall be galvanized steel pipe; pipe sleeves 6 inches and larger shall be galvanized steel sheet metal.

J. Fire Barrier Penetrations: Where pipes pass though fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 7 for special sealers and materials.

K. Install piping level with no pitch.

3.4 HANGERS AND SUPPORTS

A. General: Hanger, support, and anchor devices conforming to MSS SP-69 are specified in Division 22 Section "Hangers and Supports." Conform to the table below for maximum spacing of supports:

1. Pipe Attachments: Install the following:

a. Adjustable steel clevis hangers, MSS Type 1, for individual horizontal runs less than 20 feet in length.

b. Adjustable roller hangers, MSS Type 43, and spring hangers, MSS Type 41 with Type 49, for individual horizontal runs 20 feet and longer.

c. Pipe roll, complete MSS Type 44 for multiple horizontal runs, 20 feet or longer, support on a trapeze.

d. Spring hangers to support vertical runs.

B. Install hangers for horizontal piping with the following maximum spacing and minimum rod sizes:

PIPING SUPPORT SPACING

PIPING MATERIAL	**MAXIMUM HORIZONTAL SPACING (feet)**	**MAXIMUM VERTICAL SPACING (feet)**
Copper or copper-alloy pipe	12	10
Copper or copper-alloy tubing, 1-1/4” dia. and smaller	6	10
Copper or copper-alloy tubing, 1-1/2” dia. and larger	10	10

HANGER ROD SIZING

Nom. Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Dia. (Inches)
Up to 3/4	6	5	3/8
1	6	6	3/8
1-1/4	7	6	3/8
1-1/2	9	10	3/8
2	10	10	3/8
2-1/2	11	10	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8 (1/2 for copper)

C. Support vertical steel pipe and copper tube at each floor.

3.5 PIPE AND TUBE JOINT CONSTRUCTION

A. Soldered Joints: Comply with the procedures contained in the AWS "Soldering Manual."

B. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."

C. CAUTION: Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering and brazing.

D. Fill the tubing and fittings during soldering and brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.

E. Heat joints to proper and uniform temperature.

F. Threaded Joints: Conform to ASME B1.20.1, tapered pipe threads for field-cut threads. Join pipe fittings and valves as follows:

G. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

H. Align threads at point of assembly.

I. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

J. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

K. Damaged Threads: Do not use pipe with corroded or damaged threads. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

L. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

M. Grooved-End Joints: Prepare pipe and tubing and install in accordance with manufacturer's installation instructions.

N. Press connections: Copper press fittings shall be made in accordance with manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.6 SERVICE ENTRANCE

A. Extend water distribution piping to connect to water service piping, of size and in location indicated for service entrance to building. Water service piping is specified in a separate section of Division 2.

B. Install sleeve and mechanical sleeve seal at penetrations through foundation wall for watertight installation.

C. Install shutoff valve at service entrance inside building; complete with strainer, pressure gage, and test tee with valve.

D. Ductile-Iron Pipe: Install in accordance with AWWA C-600. Pipe below ground inside building and to a point 5 feet outside of building shall have restrained joints.

3.7 INSTALLATION OF WATER METER

A. Install water meter in accordance with utility company's installation instructions and requirements.

B. Size meter and arrange piping and specialties to comply with utility company's requirements.

C. Set meter on concrete pad as indicated. Refer to Division 3 for concrete, formwork, and reinforcing requirements.

D. Mount meter on wall brackets as indicated.

3.8 ROUGH-IN FOR WATER METER

A. Install rough-in piping and specialties for water meter installation in accordance with utility company's instructions and requirements.

3.9 VALVE APPLICATIONS

A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shut-off duty: Use gate, ball, and butterfly valves.

2. Throttling duty: Use globe, ball, and butterfly valves.

3.10 INSTALLATION OF VALVES

A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as

indicated. For sectional valves 2 inches and smaller, use gate or ball valves; for sectional valves 2-1/2 inches and larger, use gate or butterfly valves.

B. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, on each supply to each plumbing fixture, and elsewhere as indicated. For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate or butterfly valves.

C. Drain Valves: Install drain valves on each plumbing equipment item, located to drain equipment completely for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to drain distribution piping system completely. For drain valves 2 inches and smaller, use gate or ball valves; for drain valves 2-1/2 inches and larger, use gate or butterfly valves.

D. Check Valves: Install swing check valves on discharge side of each pump and elsewhere as indicated.

E. Balance Valves: Install in each hot water recirculating loop, discharge side of each pump, and elsewhere as indicated.

F. Hose Bibbs: Install on exposed piping where indicated with vacuum breaker.

G. Wall Hydrants: Install where indicated with vacuum breaker.

3.11 INSTALLATION OF PIPING SPECIALTIES

A. Install mixing valves where indicated on plans and in accessible spaces.

B. Install backflow preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air cap fitting and pipe relief outlet drain without valves to nearest floor drain.

C. Install backflow preventers at a minimum of 30" above floor. Install a drain line from the drain outlet on backflow preventer to a floor drain.

D. Install pressure-regulating valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gage on valve outlet.

3.12 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by plumbing code.

B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection; provide drain valve on drain connection. For connections 2-1/2 inches and larger, use flanges instead of unions.

3.13 FIELD QUALITY CONTROL

A. Inspections: Inspect water distribution piping as follows:

1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.

B. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed in after system is roughed in and prior to setting fixtures.

C. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.

D. Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.

E. Reports: Prepare inspection reports signed by the plumbing official.

F. Test water distribution piping as follows:

1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.

3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

5. Prepare reports for all tests and required corrective action.

3.14 ADJUSTING AND CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.

2. Use the purging and disinfecting procedure proscribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:

3. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.

4. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

5. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.

6. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.

7. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

Prepare reports for all purging and disinfecting activities.

3.15 COMMISSIONING

A. Fill the system. Check compression tanks to determine that they are not air bound and that the system is completely full of water.

B. Before operating the system, perform these steps:

1. Close drain valve, hydrants, and hose bibbs.

2. Open valves to full open position.

3. Remove and clean strainers.

4. Check pumps for proper direction of rotation. Correct improper wiring.

5. Lubricate pump motors and bearings.

END OF SECTION 221113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 221122

METERS AND GAUGES

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 meters and gauges used in plumbing systems.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Meters and gauges furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other Division 22 Sections.

2. Division 21 Section "Fire Pumps" for flow meters for testing fire pumps.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of meter, gauge, and fitting specified. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

C. Product certificates signed by manufacturers of meters and gauges certifying accuracies under specified operating conditions and compliance with specified requirements.

D. Maintenance data to include in the "Operating and Maintenance Manuals" specified in Division 1 Section "Project Closeout." Include data for the test plugs.

1.4 QUALITY ASSURANCE

A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

B. Design Criteria: The Drawings indicate types, sizes, capacities, ranges, profiles, connections, and dimensional requirements of meters and gauges and are based on the specific manufacturer types and models indicated. Meters and gauges having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as judged by the Architect. The burden of proof for equality of meters and gauges is on the proposer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Liquid-In-Glass Thermometers:
   a. Marsh Instrument Co.
   b. Marshalltown Instruments, Inc.
   c. H.O. Trerice Co.
   d. Weiss Instruments, Inc.
   e. Weksler Instruments Corp.
2. Direct-Mounting Filled-System Dial Thermometers:
   a. Ashcroft Instrument Div. of Dresser Industries.
   b. Marsh Instrument Co.
   c. H.O. Trerice Co.
   d. Weiss Instruments, Inc.
   e. Weksler Instruments Corp.
3. Remote-Reading Filled-System Dial Thermometers:
   a. AMETEK, U.S. Gauge Div.
   b. Ashcroft Dresser Industries, Instrument Div.
   c. Marsh Instrument Co.
   d. Tel-Tru Manufacturing Co., Inc.
   e. H.O. Trerice Co.
   f. Weiss Instruments, Inc.
   g. Weksler Instruments Corp.
4. Bimetal Dial Thermometers:
   a. Ashcroft Dresser Industries, Instrument Div.
   b. Marsh Instrument Co.
   c. Marshalltown Instruments, Inc.
   d. Reotemp Instrument Corp.
   e. Tel-Tru Manufacturing Co., Inc.
   f. H.O. Trerice Co.
   g. Weiss Instruments, Inc.
   h. Weksler Instruments Corp.
5. Insertion Dial Thermometers:
   a. Ashcroft Dresser Industries, Instrument Div.

b. Reotemp Instrument Corp.

c. Tel-Tru Manufacturing Co., Inc.

d. H.O. Trerice Co.

e. Weiss Instruments, Inc.

f. Weksler Instruments Corp.

6. Thermometer Wells: Same as for thermometers.

7. Pressure Gauges:

a. AMETEK, U.S. Gauge Div.

b. Ashcroft Dresser Industries, Instrument Div.

c. Marsh Instrument Co.

d. Marshalltown Instruments, Inc.

e. H.O. Trerice Co.

f. Weiss Instruments, Inc.

g. Weksler Instruments Corp.

h. WIKA Instruments Corp.

8. Pressure Gauge Accessories: Same as for pressure gauges.

9. Test Plugs:

a. Flow Design, Inc.

b. Peterson Equipment Co., Inc.

c. Sisco Co., Spedco, Inc.

d. H.O. Trerice Co.

e. Watts Regulator Co.

2.2 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed as follows:

1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions (0 to 115 deg C, with 1-degree scale divisions).

2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (minus 18 to 38 deg C, with 1-degree scale divisions).

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E1, “Liquid-in-Glass Thermometer.”

B. Case: Die cast and aluminum finished in baked epoxy enamel, glass front, spring secured, 9-inches long.

C. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 36-degree adjustment in horizontal plane, with locking device.

D. Tube: Red reading, organic liquid-filled (no mercury), with magnifying lens.

E. Scale: Satin-faced, non-reflective aluminum, with permanently etched markings.

F. Stem: Copper-plated, steel, aluminum, or brass for a separable socket of length to suit installation.

2.4 DIRECT-MOUNT FILLED-SYSTEM DIAL THERMOMETERS

A. Description: Vapor actuated, universal angle dial thermometer.

B. Case: Drawn steel or cast aluminum, with 4-1/2 inch diameter glass lens.

C. Adjustable Joint: Finish to match case, 180 degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.

D. Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.

E. Movement: Brass, precision geared.

F. Scale: Progressive stain faced non-reflective aluminum, with permanently etched markings.

G. Stem: Copper-plated steel, aluminum, or brass for a separable socket of length to suit installation.

2.5 REMOTE-READING FILLED-SYSTEM DIAL THERMOMETERS

A. Description: Vapor actuated remote-reading dial thermometer.

B. Case: Drawn steel or cast aluminum, with 4-1/2 inch diameter glass lens.

C. Movement: Brass, precision geared.

D. Scale: Progressive satin faced non-reflective aluminum with permanently etched markings.

E. Tubing: Bronze double-braided armor-over-copper capillary of length to suit installation.

F. Bulb: Copper with separable socket for liquids, averaging element for air.

2.6 BIMETAL DIAL THERMOMETERS

A. Description: Direct-mounted universal-angle dial thermometer.

B. Case: Stainless steel with 5-inch diameter glass lens.

C. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.

D. Element: Bimetal coil.

E. Scale: Satin-faced non-reflective aluminum with permanently etched markings.

F. Stem: Stainless steel for separable socket of length to suit installation.

2.7 INSERTION DIAL THERMOMETERS

A. Description: Bimetal dial thermometer.

B. Dial: 1-inch diameter.

C. Case: Stainless steel.

D. Adjustable Joint: Finished to match case, 180 degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.

E. Stem: Dustproof and leakproof 1/8-inch diameter tapered-end stem with nominal length of 5 inches.

2.8 THERMOMETER WELLS

A. Description: Brass or stainless steel thermometer well.

B. Pressure Rating: Not less than piping system design pressure.

C. Stem Length: To 2 inches into fluid.

D. Stem Length: To extend to center of pipe.

E. Extension for Insulated Piping: 2 inches nominal, but not less than thickness of insulation.

F. Threaded Cap Nut: With chain permanently fastened to well and cap.

2.9 PRESSURE GAUGES

A. Description: ASME B40.1, Grade A, phosphor-bronze Bourdon-tube pressure gauge, with bottom connection.

B. Case: Drawn steel, brass or aluminum, with 4-1/2 inch diameter glass lens.

C. Connector: Brass, 1/4-inch NPS.

D. Scale: White coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:

1. Vacuum: 30 inches Hg of vacuum to 15 psi of pressure.

2. Water: 0-160 psi.

3. Air: See Division 22 Section "Compressed Air Systems" for operating range of gauges for compressed air systems.

4. Fuel Gas: 0-32 in. w.c.

5. Medical Gas: See Division 22 Section "Medical Gas Piping Systems" for operating range of gauges for medical gas systems.

6. Fire: 0-300 psi.

2.10 PRESSURE GAUGE ACCESSORIES

A. Snubber: 1/4 inch NPS brass bushing with corrosion-resistant porous metal disc of material suitable for fluid served and rated pressure.

2.11 TEST PLUGS

A. Description: Nickel-plated brass body test plug in 1/2 inch NPS fitting.

B. Body: Length as required to extend beyond insulation.

C. Pressure Rating: 500 psig minimum.

D. Core Inserts: 2 self-sealing valve-types, suitable for inserting a 1/8 inch outside diameter probe from a dial thermometer or pressure gauge.

E. Core Material: According to the following for fluid and temperature range:

1. Air, Water, Oil, and Gas, 20 to 200 degrees F. (minus 7 to 93 degrees C), neoprene rubber.

2. Air and Water, minus 30 degrees to 275 degrees F (minus 35 to 136 degrees C), ethylene-propylene-dieneterpolymer (EPDM) rubber.

F. Test Plug Cap: Gasketed and threaded cap with retention chain.

G. Test Kit: Provide test kit consisting of 1 pressure gauge, gauge adapter with probe, 2 bimetal dial thermometers, and carrying case.

H. Pressure Gauge and Thermometer Ranges: Approximately 2 times systems operating conditions.

PART 3 EXECUTION

3.1 METER AND GAUGE APPLICATIONS

A. General: Where indicated, install meters and gauges of types, sizes, capacities, and with features indicated.

3.2 METER AND GAUGE INSTALLATION, GENERAL

A. Install meters, gauges, and accessories according to manufacturer's written instructions for applications where used. Install where accessible and viewable.

3.3 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions.

B. Install in the following locations and elsewhere as indicated:

1. At inlet and outlet of each hot water recirculation balancing station.

2. At inlet and outlet of each remote water cooler chiller.

3. At inlet and outlet of each water heater.

C. Remote-Reading Dial Thermometers: Install in control panels, with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.

D. Thermometer Wells: Install in vertical position in piping tees where thermometers are indicated.

1. Install wells with stem extending minimum of 2 inches into fluid.

2. Install wells with stem extending to center of pipe.

3. Fill wells with oil or graphite and secure cap.

3.4 PRESSURE GAUGE INSTALLATION

A. Install pressure gauges in piping tee with pressure gauge valve located on pipe at most readable position.

B. Install in the following locations, and elsewhere as indicated:

1. At suction and discharge of each pump.

2. At discharge of each pressure-reducing valve.

3. At building water service entrance.

C. Pressure Gauge Needle Valves: Install in piping tee with snubber.

3.5 TEST PLUG INSTALLATION

A. Install test plugs in piping tees where indicated, located on pipe at most readable position. Secure cap.

3.6 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. The drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install meters and gauges adjacent to equipment to allow servicing and maintenance.

3.7 ADJUSTING AND CLEANING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.

C. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touch-up paint.

END OF SECTION 221122

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 221123

WATER DISTRIBUTION PUMPS

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 types of water distribution pumps for plumbing systems:

1. In-line circulators.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 22 Section "Meters and Gages" for pressure gages.
2. Division 22 Section "Motors" for pump motors.
3. Division 22 Section "Vibration Control" for inertia pads, isolation pads, spring supports, and spring hangers.
4. Division 22 Section "Plumbing Piping" for piping not specified in this Section.
5. Division 22 Section "Booster Systems" for packaged, booster systems to maintain building water distribution system pressure.
6. Division 26 Sections for power-supply wiring, field-installed disconnects, required electrical devices, and motor controllers.

1.3 PUMP PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to system maximum operating pressure at point where installed.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories. Include startup instructions.

C. Shop drawings showing layout and connections for pumps. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.

D. Wiring diagrams detailing wiring for power, signal, and control systems differentiating between manufacturer-installed wiring and field-installed wiring.

E. Product certificates signed by pump manufacturers certifying accuracies under specified operating conditions and compliance with specified requirements.

F. Maintenance data for each type and size pump specified to include in the "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout."

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:

1. ASME B31.9 "Building Services Piping" for piping materials and installation.

2. H.I. "Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps" for pump design, manufacture, and installation.

3. UL 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labelling.

4. NEMA MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labelling.

5. NFPA 70 "National Electrical Code" for electrical components and installation.

B. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer.

C. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer with pumps, components, and accessories from a single source. Include responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance, and acceptance of pumps.

D. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Architect. The burden of proof for equality of pumps is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a clean, dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

D. Extended Storage Greater Than 5 Days: Dry internal parts with hot air or a vacuum-producing device. After drying, coat internal parts with light oil, kerosene, or antifreeze. Dismantle bearings and couplings, dry and coat with an acid-free heavy oil, and tag and store in a dry location.

E. Comply with pump manufacturer's rigging instructions for handling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in 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. All-Bronze, In-Line Circulators:
   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Div., ITT Fluid Technology Corp.
   d. Dunham-Bush, Inc.
   e. Grundfos Pumps Corp.
   f. Taco, Inc.
2. Aquastats:
   a. Honeywell Inc.
   b. Johnson Controls Inc.
   c. Barber-Coleman Co.
3. Time Clocks:
   a. Intermatic, Inc.
   b. Paragon Electric Co.
   c. Tork, Inc.

2.2 PUMPS, GENERAL

A. Water Distribution Pumps: Factory assembled and tested.

B. Capacities and Characteristics: As indicated.

C. Motors: NEMA MG 1; single, multiple, or variable speed with type of enclosure and electrical characteristics indicated. Include built-in thermal-overload protection and grease-lubricated ball bearings. Motors are non-overloading within full range of pump performance curves.

D. Finish: Manufacturer's standard paint applied to factory-assembled and -tested plumbing pump units before shipping.

E. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.3 IN-LINE CIRCULATORS

A. General Description: Horizontal, in line, centrifugal, single stage, rated for 125-psig (860kPa) minimum working pressure and 225 deg F (107 deg C) continuous water temperature.

B. All-Bronze, In-Line Circulator: Horizontal, in line, centrifugal, single stage, all bronze, with radially split case design.

1. Casing: Bronze, with threaded companion flanges for piping connections smaller than 2-1/2 inches (65 mm), and threaded gage tappings at inlet and outlet connections.

2. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.

3. Impeller: ASTM B 36/B 36M, rolled-temper brass, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.

4. Shaft and Sleeve: Steel shaft with oil-lubricated copper sleeve.

5. Mechanical Seals: Carbon steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.

6. Pump Bearings: Oil-lubricated bronze journal and thrust bearings.

7. Motor Bearings: Oil-lubricated sleeve bearings.

8. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

9. Motor: Resiliently mounted to the pump casing.

C. Compact, In-Line Circulator: Leakproof, in-line, sealless, volute-type pump. Include pump and motor assembled on a common shaft in a hermetically sealed unit, without stuffing boxes or mechanical seals. Lubricate sleeve bearing and cool motor by circulating pumped liquid through motor section. Isolate motor section from motor stator windings with a corrosion-resistant, nonmagnetic alloy liner.

1. Casing: Cast bronze, with stainless-steel liner and static O-ring seal to separate motor section from motor stator, and flanged piping connections.

2. Casing: Cast iron, with stainless-steel liner and static O-ring seal to separate motor section from motor stator, and flanged piping connections.

3. Impeller: Overhung, single-suction, closed or open nonmetallic impeller.

4. Shaft and Sleeve: Stainless-steel shaft with carbon-steel bearing sleeve.

5. Motor: Multispeed.

6. Motor: Single speed.

2.4 AQUASTAT

A. General: Provide an immersion type aquastat to automatically start the pump when the temperature in the recirculating line is below the set point, when the temperature is satisfied (at system temperature), contacts open to stop the pump.

B. Controls: Set aquastat for main hot water system at 115^{o}F.

2.5 TIME CLOCK

A. General: Seven (7) day calendar dial; number of trippers to suit required number of on-off cycles; 120 volt, SPST, minimum 40A per pole rating; spring-wound reserve power feature to keep dial on time for 10 hours minimum; in surface-mount NEMA 1 enclosure, with lockable hasp.

2.6 GENERAL-DUTY VALVES

A. Refer to Division 22 Section "Valves" for general-duty gate, ball, butterfly, globe, and check valves.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections prior to pump installation.

3.2 CONCRETE

A. Install concrete bases of dimensions indicated for base-mounted pumps. Refer to Division 3 Section "Cast-in-Place Concrete" and Division 22 Section "Basic Mechanical Materials and Methods."

3.3 INSTALLATION

A. Install pumps according to the manufacturer's written installation instructions.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support pumps and piping so that weight of piping is not supported by pumps.

D. Suspend horizontal, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps. Fabricate brackets or supports as required for pumps.

E. Suspend vertical, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps.

3.4 CONNECTIONS

A. Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.

B. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

C. Install shutoff valve and strainer on suction side of in-line pumps and circulators.

D. Install check valve and throttling valve on discharge side of in-line pumps and circulators.

E. Install pressure gage connector plugs in suction and discharge piping around pumps. Pressure gage connector plugs are specified in Division 22 Section "Meters and Gages."

F. Install electrical connections for power, controls, and devices.

G. Electrical power and control wiring and connections are specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

A. Check suction piping connections for tightness to avoid drawing air into pumps.

B. Clean strainers on pump suction piping.

C. Pump Controls: Set pump controls for automatic start, stop, and alarm operation.

3.6 COMMISSIONING

A. Final Checks Before Startup: Perform the following preventive maintenance operations and checks before startup:

1. Lubricate oil-lubricated-type bearings.

2. Remove grease-lubricated bearing covers and flush bearings with kerosene and thoroughly clean. Fill with new lubricant according to manufacturer's recommendations.

3. Disconnect couplings and check motors for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that pumps are free to rotate by hand. Pumps for handling hot liquids shall be free to rotate with pump hot and cold. Do not operate pump if bound or if it drags even slightly until cause of trouble is determined and corrected.

5. Check that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power:

1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.

2. Open cooling water supply valves if stuffing boxes are water cooled.

3. Open the liquid supply valves if pumps are so fitted.

4. Open circulating line valves if pumps should not be operated against dead shutoff.

5. Start motors.

6. Open discharge valves slowly.

7. Observe leakage from stuffing boxes and adjust sealing liquid valves for proper flow to ensure lubrication of packing. Let packing "run in" before reducing leakage through stuffing boxes, then tighten glands.

8. Check general mechanical operation of pumps and motors.

9. Close circulating piping valves once there is sufficient flow through pumps to prevent overheating.

10. Remove startup strainers from suction diffusers and install permanent strainers after system has been in operation.

C. When pumps are to be started against closed check valves with discharge gate valves open, steps are same except open discharge gate valves some time before motors are started.

END OF SECTION 221123

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 221124

WATER PRESSURE BOOSTER PUMPS

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 types of plumbing pumps:
   1. Variable speed Packaged pumping system.

B. Requirements of the following Division 22 Sections apply to this section:

   1. "Basic Plumbing Requirements."

   2. "Plumbing Piping."

C. Related Sections: The following sections contain requirements that relate to this section:

   1. Division 3 Section "Concrete Work" for specifications on concrete and reinforcing materials and concrete placing requirements for equipment pads.

   2. Division 26 Section "Wiring of Mechanical Equipment" for power-supply wiring including field-installed disconnects and required electrical devices.

   3. Division 26 Section "Plumbing Motor Controls" for field-installed, a.c. motor controllers.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

   1. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories, plus installation and start-up instructions.

   2. Shop drawings showing layout and connections for plumbing pumps. Include setting drawings with templates, and directions for installation of foundation bolts, anchor bolts, and other anchorages.

   3. Wiring diagrams detailing wiring for power, signal, and control systems; differentiating between manufacturer-installed wiring and field-installed wiring.

   4. Maintenance data for plumbing pumps, for inclusion in Operating and Maintenance Manuals specified in Division 22 Section "Basic Plumbing Requirements."

1.4 QUALITY ASSURANCE

A. Hydraulic Institute Compliance: Design, manufacture, and install plumbing pumps in accordance with "Hydraulic Institute Standards."

B. ANSI – American National Standards Institute

C. ASTM – American Society for Testing and Materials

D. IEEE – Institute of Electrical and Electronics Engineers

E. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."

F. UL Compliance: Plumbing pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."

G. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.

H. Single-Source Responsibility: Obtain plumbing pumps of the same type from a single manufacturer.

I. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of plumbing pumps and are based on the specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Architect. The burden of proof for equality of plumbing pumps is on the proposer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

1.6 WARRANTY

A. The pump system shall be guaranteed in writing by the manufacturer for a period of one year from date of start-up against defect in design, material, or construction.

1.7 FACTORY TEST AND CERTIFICATION

A. The booster system and its components shall undergo a complete operation flow test from zero to 100% design flow rate under the specified suction and net system pressure conditions. The system certification shall include copies of the test data as witnessed by a factory engineer. Performance test certifications shall be placed inside the system control panel and extra copies with the installation manual.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Water Pressure Booster Pumps:

a. "Grundfos Hydro Multi B/E

2.2 PUMPS, GENERAL

A. Pumps: prefabricated factory assembled and factory tested.

1. All pumps shall be ANSI NSF 61 / NSF372 Listed for drinking water and low lead requirements.

2. The pumps shall be of the in-line vertical multi-stage design.

B. Preparation for shipping: After assembly and testing, clean flanges and exposed machined metal surfaces and treat with an anticorrosion compound. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

C. Motors: Conform to NEMA standards; single, multiple, or variable speed with type of enclosure and electrical characteristics as indicated; have built-in thermal-overload protection and grease-lubricated ball bearings. Select motors that are nonoverloading within the full range of the pump performance curve.

D. Apply factory finish paint to assembled, tested units prior to shipping.

2.3 WATER PRESSURE BOOSTER SYSTEM

A. General Description: Pumps shall be variable speed packaged pumping system.

B. Capacity: Furnish and install a prefabricated two-pump, packaged booster system capable of providing a constant system pressure and flow rate as shown on the plumbing drawings:

C. The pumps shall be NSF 372 Listed for drinking water.

D. The pumps shall be of the end-suction horizontal multi-stage design with the discharge vertical on the centerline of the pump.

E. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.

F. Cast Iron Horizontal End-suction Multi-Stage Pumps (12mm or 16mm shaft, Nominal flow from 10 to 130 gallons per minute) shall have the following features:

1. The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement with a Stop Ring and Nord-lock® washer or similar, which makes it possible to disassemble the pump from the pump side.

2. The suction/discharge shall have internal pipe thread (NPT) connections as determined by the pump station manufacturer.

3. On the top of the inlet part should be a priming plug to allow the pump to be nearly completely filled with the liquid to be pumped.

4. On the lower side of the inlet part should be a drain plug.

5. Pump Construction.

a.	Inlet Part, Discharge Part:	Cast iron (Class 30)
b.	Impellers, chambers:	304 Stainless Steel
c.	Shaft:	431 Stainless Steel
e.	Spacing Pipe:	316 Stainless Steel
f.	O-rings:	EPDM

6. The shaft seal shall be an o-ring seal with fixed driver type with the following features:

a.	Retainer and Driver for Seal Ring:	304 or 316 Stainless Steel
b.	Spring:	304 or 316 Stainless Steel
c.	Stationary Seal:	Silicon Carbide (Graphite Imbedded)
d.	Rotating Seal:	Silicon Carbide (Graphite Imbedded)
e.	O-rings:	EPDM

G. AISI 304 or 316 Stainless Steel End-suction Horizontal Multi-Stage Pumps (12mm or 16mm shaft, Nominal flow from 10 to 130 gallons per minute) shall have the following features:

1. The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement with a Stop Ring and Nord-lock® washer or similar, which makes it possible to disassemble the pump from the pump side.

2. The suction/discharge shall have internal pipe thread (NPT) connections as determined by the pump station manufacturer.

3. On the upper area of the flange should be a priming port to allow the pump to be nearly completely filled with the liquid to be pumped.

4. On the bottom side of the pump sleeve should be a drain hole

5. Pump Construction.

a.	Flange:	Cast Iron
b.	Impellers, Chambers, Sleeve:	304 or 316 Stainless Steel
c.	Shaft:	304 or 316 Stainless Steel
e.	Spacing Pipe:	316 Stainless Steel
f.	O-rings:	EPDM

6. The shaft seal shall be an o-ring seal with fixed driver type with the following features:

a.	Retainer and Driver for Seal Ring:	304 or 316 Stainless Steel
b.	Spring:	304 or 316 Stainless Steel
c.	Stationary Seal:	Silicon Carbide (Graphite Imbedded)
d.	Rotating Seal:	Silicon Carbide (Graphite Imbedded)
e.	O-rings:	EPDM

2.4 INTEGRATED VARIABLE FREQUENCY DRIVE MOTORS

A. Each motor shall be of the Integrated Variable Frequency Drive design consisting of a motor and a Variable Frequency Drive (VFD) built and tested as one unit by the same manufacturer.

B. The VFD shall be of the PWM (Pulse Width Modulation) design using current IGBT (Insulated Gate Bipolar Transistor) technology.

C. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of motor. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump control and to eliminate the need for motor de-rating.

D. The VFD shall utilize an energy optimization algorithm to minimize energy consumption. The output voltage shall be adjusted in response to the load, independent of speed.

E. The VFD shall automatically reduce the switching frequency and/or the output voltage and frequency to the motor during periods of sustained ambient temperatures that are higher than the normal operating range. The switching frequency shall be reduced before motor speed is reduced.

F. An integral RFI filter shall be standard in the VFD.

G. The VFD shall have a minimum of two skip frequency bands which can be field adjustable.

H. The VFD shall have internal solid-state overload protection designed to trip within the range of 125-150% of rated current.

I. The integrated VFD motor shall include protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage, VFD over-temperature, and motor over-temperature. Three-phase integrated VFD motors shall be capable of providing full output voltage and frequency with a voltage imbalance of up to 10%.

J. The integrated VFD motor shall have, as a minimum, the following input/output capabilities:

   1. Speed Reference Signal: 0-10 VDC, 4-20mA
   2. Digital remote on/off
   3. Fault Signal Relay (NC or NO)
   4. Fieldbus communication port (RS485)

K. The motor shall be Totally Enclosed Fan Cooled (TEFC) with a standard NEMA C-Face, Class F insulation with a temperature rise no higher than Class B.

L. The cooling design of the motor and VFD shall be such that a Class B motor temperature rise is not exceeded at full rated load and speed at a minimum switching frequency of 9.0 kHz.

M. Motor drive end bearings shall be adequately sized so that the minimum L10 bearing life is 17,500 hours at the minimum allowable continuous flow rate for the pump at full rated speed.

2.5 PUMP SYSTEM CONTROLLER

A. The pump system controller shall be a standard product developed and supported by the pump manufacturer.

B. The controller shall be microprocessor based capable of having software changes and updates via personal computer (notebook). The controller shall be designed specifically for control of parallel connect pumps in constant pressure applications.

C. The controller shall provide internal galvanic isolation to all digital and analog inputs as well as all fieldbus connections.

D. The controller shall display the following as status readings from a single display on the controller (this display shall be the default):
- Current value of the control parameter, (typically discharge pressure)
- Alarm indication (if any)

E. The controller shall have as a minimum the following hardware inputs and outputs:
- Two analog inputs (4-20mA or 0-10VDC)
- Two digital inputs
- Two digital outputs
- Three PTC connections for motor monitoring
- Field Service connection to PC for advanced programming and data logging

F. Pump system programming (field adjustable) shall include as a minimum the following:
- Current setpoint
- Pump control Off/Auto
- System control On/Off
- Alarm reset

G. Pump system programming (field Service connection to PC for advanced programming) shall include as a minimum the following:
- Water shortage protection (analog or digital)
- Transducer Settings (Suction and Discharge Analog supply/range)
- PI Controller (Proportional gain and Integral time) settings
- High system pressure indication and shut-down
- Low system pressure indication and shut-down
- Low suction pressure/level shutdown (via digital contact)
- Low suction pressure/level warning (via analog signal)
- Low suction pressure/level shutdown (via analog signal)
- Flow meter settings (if used, analog signal)

H. The controller shall be capable of receiving a remote analog set-point (4-20mA or 0-10 VDC) as well as a remote system on/off (digital) signal.

I. The pump system controller shall be mounted in a UL Type 3R rated enclosure. A self-certified NEMA enclosure rating shall not be considered equal. The entire control panel shall be UL 508 listed as an assembly. The control panel shall include a main disconnect, circuit breakers for each pump and the control circuit and control relays for alarm functions.

Control panel options shall include:

Emergency/Normal Operation Switches, located on front of panel.

J. The controller shall be capable of receiving a redundant sensor input to function as a backup to the primary sensor (typically discharge pressure).

K. The controller shall have the ability to communicate common field-bus protocols, (BACnet, Modbus, Profibus, and LON), via optional communication expansion card installed inside controller.

2.6 SEQUENCE OF OPERATION

A. The system controller shall operate equal capacity variable speed pumps to maintain a constant discharge pressure (system set-point). The system controller shall receive an analog signal [4-20mA] from the factory installed pressure transducer on the discharge manifold, indicating the actual system pressure. As flow demand increases the pump speed shall be increased to maintain the system set-point pressure. When the operating pump(s) reach 97% of full speed (adjustable), an additional pump will be started and will increase speed until the system set-point is achieved. When the system pressure is equal to the system set-point all pumps in operation shall reach equal operating speeds. As flow demand decreases the pump speed shall be reduced while system set-point pressure is maintained. When all pumps in operation are running at low speed the system controller shall switch off pumps when fewer pumps are able to maintain system demand.

B. The system controller shall be capable of switching pumps on and off to satisfy system demand without the use of flow switches, motor current monitors or temperature measuring devices.

C. All pumps in the system shall alternate automatically based on demand, time and fault. If flow demand is continuous (no flow shut-down does not occur), the system controller shall have the capability to alternate the pumps every 24 hours, every 48 hours or once per week. The interval and actual time of the pump change-over shall be field adjustable.

2.7 LOW FLOW STOP FUNCTION

A. The system controller shall be capable of stopping pumps during periods of low-flow or zero-flow without wasting water or adding unwanted heat to the liquid. Temperature based no flow shut-down methods that have the potential to waste water and add unwanted temperature rise to the pumping fluid are not acceptable.

B. Standard Low Flow Stop and Energy Saving Mode

If a low or no flow shut-down is required (periods of low or zero demand) a bladder type diaphragm tank shall be installed with a pre-charge pressure of 70% of system set-point. The tank shall be piped to the discharge manifold or system piping downstream of the pump system. When only one pump is in operation the system controller shall be capable of detecting low flow (less than 10% of pump nominal flow) without the use of additional flow sensing devices. When a low flow is detected, the system controller shall increase pump speed until the discharge pressure reaches the stop pressure (system set-point plus 50% of programmed on/off band). The pump shall remain off until the discharge pressure reaches the start pressure (system set-point minus 50% of programmed on/off band). Upon low flow shut-down a pump shall be restarted in one of the following two ways:

1. Low Flow Restart: If the drop in pressure is slow when the start pressure is reached (indicating the flow is still low), the pump shall start and the speed shall again be increased until the stop pressure is reached and the pump shall again be switched off.

2. Normal Flow Restart: If the drop in pressure is fast (indicating the flow is greater than 10% of pump nominal flow) the pump shall start and the speed shall be increased until the system pressure reaches the system set-point.

2.8 SYSTEM CONSTRUCTION

A. Suction and discharge manifold construction shall be in way that ensures minimal pressure drops, minimize potential for corrosion, and prevents bacteria growth at intersection of piping into the manifold. Manifold construction that includes sharp edge transitions or interconnecting piping protruding into manifold is not acceptable. Manifold construction shall be such that water stagnation can not exist in manifold during operation to prevent bacteria growth inside manifold.

B. The suction and discharge manifolds shall be constructed of 316 stainless steel. Manifold connection sizes shall be as follows:

3 inch and smaller:	Male NPT threaded
4 inch	ANSI Class 150 rotating flanges

C. Pump Isolation valves shall be provided on the suction and discharge of each pump. Isolation valve sizes 2 inch and smaller shall be nickel plated brass full port ball valves. Isolation valve sizes 3 inch and larger shall be a full lug style butterfly valve. The valve disk shall be of stainless steel. The valve seat material shall be EPDM and the body shall be cast iron, coated internally and externally with fusion-bonded epoxy.

D. A spring-loaded non-slam type check valve shall be installed on the discharge of each pump. The valve shall be a wafer style type fitted between two flanges. The head loss through the check valve shall not exceed 5 psi at the pump design capacity. Check valves 1-1/2” and smaller shall have a POM composite body and poppet, a stainless steel spring with EPDM or NBR seats. Check valves 2” and larger shall have a body material of stainless steel or epoxy coated iron (fusion bonded) with an EPDM or NBR resilient seat. Spring material shall be stainless steel. Disk shall be of stainless steel or leadless bronze.

E. For systems that require a diaphragm tank, a connection of no smaller than ¾” shall be provided on the discharge manifold.

F. A pressure transducer shall be factory installed on the discharge manifold (or field installed as specified on plans). A factory installed pressure switch on the suction manifold for water shortage protection. Pressure transducers shall be made of 316 stainless steel. Transducer accuracy shall be +/- 1.0% full scale with hysteresis and repeatability of no greater than 0.1% full scale. The output signal shall be 4-20 mA with a supply voltage range of 9-32 VDC.

G. A bourdon tube pressure gauge, 2.5 inch diameter, shall be placed on the suction and discharge manifolds. The gauge shall be liquid filled and have copper alloy internal parts in a stainless steel case. Gauge accuracy shall be 2/1/2 %. The gauge shall be capable of a pressure of 30% above its maximum span without requiring recalibration.

H. The base frame shall be constructed of corrosion resistant 304 stainless steel. Rubber vibration dampers shall be fitted between each pumps and baseframe to minimize vibration.

2.9 TESTING

A. The entire pump station shall be factory tested for functionality. Functionality testing shall include the following parameters: Dry Run Protection, Minimum Pressure and Maximum Pressure alarms (where applicable), Setpoint Operation, and Motor Rotation.

B. The system shall undergo a factory hydrostatic test at the end of the production cycle. The system shall be filled with water and pressurized to 1.5 times the nameplate maximum pressure. Systems with 150# flange connections shall be tested at 350 psig, and systems with 300# flange connections shall be tested at 450 psig. The pressure shall be maintained for a minimum of 15 minutes with no leakage (slight leakage around pump(s) mechanical seal is acceptable) prior to shipment.

2.10 WARRANTY

A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present, for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in for plumbing piping systems to verify actual locations of piping connections prior to installation.

3.2 EQUIPMENT BASES

A. Construct concrete equipment pads as follows:

1. Form concrete pads by using framing lumber with form release compounds. Chamfer top edge and corners of pad.

2. Install reinforcing bars, tied to frame, and place anchor bolts and sleeves using manufacturer's installation template.

3. Place concrete and allow to cure before installation of pumps. Use Portland Cement conforming to ASTM C 150, 4,000 psi compressive strength, and normal weight aggregate.

3.3 INSTALLATION

A. General: Comply with the manufacturer's written installation and alignment instructions.

B. Install pumps in locations and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support pumps and piping separately so that the weight of the piping system does not rest on the pump.

D. Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until the alignment operations have been completed.

1. Support pump base plate on rectangular metal blocks and shims, or on metal wedges having a small taper, at points near the foundation bolts to provide a gap of 3/4 to 1-1/2 inches between the pump base and the foundation for grouting.

2. Adjust the metal supports or wedges until the shafts of the pump and driver are level. Check the coupling faces and suction and discharge flanges of the pump to verify that they are level and plumb.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundations, after grout has been set and foundations bolts have been tightened, and after piping connections have been made.

B. Adjust alignment of pump and motor shafts for angular and parallel alignment by one of the two methods specified in the Hydraulic Institute "Centrifugal Pumps - Instructions for Installation, Operation and Maintenance."

C. After alignment is correct, tighten the foundation bolts evenly but not too firmly. Fill the base plate completely with nonshrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has cured, fully tighten foundation bolts.
    1. Alignment tolerances shall meet manufacturers' recommendations.

3.5 CONNECTIONS

A. General: Install valves that are same size as the piping connecting the pump.

B. Install suction and discharge pipe sizes equal to or greater than the diameter of the pump nozzles.

C. Install a gate valve and strainer on the suction side of pumps.

D. Install flexible connectors on the suction and discharge side of each base-mounted pump. Install flexible connectors between the pump casing and the discharge valves and upstream from the pump suction diffuser.

E. Electrical wiring and connections are specified in Division 26 sections.

F. Control wiring and connections are specified in other Division 22 sections.

3.6 FIELD QUALITY CONTROL

A. Check suction lines connections for tightness to avoid drawing air into the pump.

3.7 COMMISSIONING

A. Start-Up Service: The service of a factory-trained representative shall be made available on the job site to check installation and start-up, and to instruct operating personnel.

B. Final Checks Before Start-Up: Perform the following preventative maintenance operations and checks before start-up:

1. Lubricate oil-lubricated bearings.

2. Remove grease-lubricated bearing covers and flush the bearings with kerosene and thoroughly clean. Fill with new lubricant in accordance with the manufacturer's recommendations.

3. Disconnect coupling and check motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

4. Check that pump is free to rotate by hand. For pumps handling hot liquids, pump shall be free to rotate with the pump hot and cold. If the pump is bound or even drags slightly, do not operate the pump until the cause of the trouble is determined and corrected.

C. Starting procedure for pumps with shutoff power not exceeding the safe motor power:

1. Prime the pump, opening the suction valve, closing the drains, and prepare the pump for operation.

2. Open the recirculating line valve if the pump should not be operated against dead shutoff.

3. Start motor.

4. Open the discharge valve slowly.

5. Observe the leakage from the stuffing boxes and adjust the sealing liquid valve for proper flow to ensure the lubrication of the packing. Do not tighten the gland immediately, but let the packing run in before reducing the leakage through the stuffing boxes.

6. Check the general mechanical operation of the pump and motor.

7. Close the recirculating line valve once there is sufficient flow through the pump to prevent overheating.

D. If the pump is to be started against a closed check valve with the discharge gate valve open, the steps are the same except that the discharge gate valve is opened some time before the motor is started.

END OF SECTION 221124

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 221310

DRAINAGE AND VENT SYSTEMS

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 building sanitary and storm drainage and vent piping systems, including drains and drainage specialties.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 2 Section "Earthwork," for trenching and backfilling materials and methods for underground piping installations.

2. Division 2 Section "Sanitary Sewage System," for sanitary drainage piping beginning from 5' - 0" outside the building.

3. Division 2 Section "Foundation Drainage," for foundation drain piping.

4. Division 7 Section "Joint Sealers," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.

5. Division 22 Section "Plumbing Identification," for labeling and identification of drainage and vent piping.

1.3 DEFINITIONS

A. Building Drain: That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.

B. Building Sewer: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.

C. Drainage System: Includes all the piping within a public or private premises which conveys sewage, rain water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.

D. Vent System: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

1.4 SUBMITTALS

A. Product data for the following products:

1. Drainage piping specialties.

2. Floor drains.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: comply with the provisions of the following:

1. NYS Plumbing Code.

B. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate flashing materials installation of roofing, waterproofing, and adjoining substrate work.

B. Coordinate the installation of drains in poured-in-place concrete slabs, to include proper drain elevations, installation of flashing, and slope of slab to drains.

C. Coordinate with installation of sanitary and storm sewer systems as necessary to interface building drains with drainage piping systems and work of other trades.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drainage and vent systems which may be incorporated in the work include, but are not limited to, the following:

B. Manufacturer: Subject to compliance with requirements, provide drainage and vent systems from one of the following:

C. Drainage Piping Specialties, including backwater valves, expansion joints, drains, trap primers, and vandal-proof vent caps:

1. Josam Mfg. Co.

2. Smith (Jay R) Mfg. Co.

3. Tyler Pipe; Subs. of Tyler Corp.

4. Zurn Industries Inc; Hydromechanics Div.

5. Watts Drainage Products; Division of Watts Regulator

2.2 ABOVE GROUND DRAINAGE AND VENT PIPE AND FITTINGS

A. Copper Tube: ASTM B306, Type DWV for pipe, and cast-bronze, drainage pattern fittings, with soldered joints.

B. Solder Filler Materials: ASTM B32, 50-50 tin-lead solder.

C. Cast-Iron Soil Pipe: ASTM A74, CISPI HS 74, Service weight, hub-and-spigot soil pipe and fittings.

D. Compression gaskets: ASTM C564.

E. Hubless Cast-Iron Soil Pipe: CISPI Standard 301, Service weight, cast-iron soil pipe and fittings, with clamps and neoprene gaskets conforming to CISPI Standard 310.

2.3 UNDERGROUND BUILDING DRAIN PIPE AND FITTINGS

A. Cast-Iron Soil Pipe: ASTM A74, CISPI HS 74, Service weight, hub-and-spigot soil pipe and fittings. Pipe and fittings shall have a heavy coating of coal tar varnish or asphaltum on both inside and outside surfaces.

B. Neoprene Compression Gaskets: ASTM C564.

2.4 DRAINAGE PIPING SPECIALTIES

A. Backwater Valves: Valve assembly shall be bronze fitted cast-iron, with bolted cover. Flapper shall provide a maximum 1/4 inch clearance between flapper and seat for air circulation. Valve ends shall suit piping material.

B. Expansion Joints: Cast-iron body with adjustable bronze sleeve, bronze bolts with wing nuts.

C. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.

D. Floor Cleanouts: Cast-iron body and frame, with cleanout plug and adjustable round top -See Schedule on drawings

E. Vent Flashing Sleeves: Cast-iron calking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.

2.5 FLOOR DRAINS

A. Floor drain type designations and sizes are indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.

B. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.

C. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOUNDATION FOR UNDERGROUND BUILDING DRAINS

A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with compacted, clean sand or pea gravel to indicated invert elevation.

C. Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

3.3 PIPE APPLICATIONS - ABOVE GROUND, WITHIN BUILDING

A. Install copper tube with cast bronze fittings for 3 inch and smaller, drainage and vent pipe.

B. Install hub-and-spigot, service weight, cast-iron soil pipe with compression gasket joints for larger than 1-1/2-inch drainage and vent pipe.

C. Install hubless, service weight, cast-iron soil pipe and fittings for larger than 1-1/2-inch drainage and vent pipe.

3.4 PIPE APPLICATIONS - BELOW GROUND, WITHIN BUILDING

A. Install hub-and-spigot, service weight, cast-iron, soil pipe and fittings with gasketed joints for 15 inch and smaller drainage pipe.

3.5 PIPE AND TUBE JOINT CONSTRUCTION

A. Copper Tubing: Solder joints in accordance with the procedures specified in AWS "Soldering Manual."

B. Cast-Iron Soil Pipe: Make compression joints and hubless joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Chapter IV

3.6 INSTALLATION

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into account many design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and all branch connections.

C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inches and larger shall be sheet metal.

H. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.

I. Make changes in direction for drainage and vent piping using appropriate 45 degree wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited

J. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

K. Install building drain pitched down at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger.

L. Extend building drain to connect to sewer piping, of size and in location indicated for service entrance to building. Sewer piping is specified in a separate section of Division 2.

M. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation.

N. Install 1 inch thick extruded polystyrene over underground building drain piping not under building. Width of insulation shall extend minimum of 12 inch beyond each side of pipe. Install directly over, and center on pipe center line.

3.7 HANGERS AND SUPPORTS

A. General: Hanger, supports, and anchors devices are specified in Division 22 Section "Basic Mechanical Materials and Methods." Conform to the table below for maximum spacing of supports:

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.

C. Install hangers at the following intervals:

PIPING SUPPORT SPACING

PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING (feet)	MAXIMUM VERTICAL SPACING (feet)
ABS pipe	4	10
Cast-iron pipe	5	15
Copper or copper-alloy tubing, 1-1/4" dia. and smaller	6	10
Copper or copper-alloy tubing, 1-1/2" dia. and larger	10	10

HANGER ROD SIZING

Nom. Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Dia. (Inches)
Up to 3/4	6	5	3/8
1	6	6	3/8
1-1/4	7	6	3/8
1-1/2	9	10	3/8
2	10	10	3/8
2-1/2	11	10	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8 (1/2 for copper)

D. Support vertical steel pipe and copper tube at each floor.

3.8 INSTALLATION OF PIPING SPECIALTIES

A. Install backwater valves in sanitary building drain piping as indicated, and as required by the plumbing code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service.

B. Install expansion joints on vertical risers as indicated, and as required by the plumbing code.

C. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and: as required by plumbing code; at each change in direction of piping greater than 45 degrees; at minimum intervals of 100'; at base of each vertical soil or waste stack; flush with floor finish for interior installations; flush with grade for exterior installations.

D. Cleanouts Covers: Install floor and wall cleanout covers for concealed piping, types as indicated.

E. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

F. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

G. Frost-Proof Vent Caps: Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1 inch clearance between vent pipe and roof substrate.

3.9 INSTALLATION OF FLOOR DRAINS

A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Set drain elevation depressed below finished slab elevation as listed below to provide proper slope to drain:

D. Trap all drains connected to the sanitary sewer.

E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Position drains so that they are accessible and easy to maintain.

3.10 CONNECTIONS

A. Piping Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the plumbing code.

B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.11 FIELD QUALITY CONTROL

A. Inspections:

1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.

B. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.

C. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.

D. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspected by the plumbing official.

E. Reports: Prepare inspection reports, signed by the plumbing official.

F. Piping System Test drainage and vent system in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:

G. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

H. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.

I. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.

J. Finished Plumbing Test Procedure: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.

K. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

L. Prepare reports for all tests and required corrective action.

3.12 ADJUSTING AND CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Clean drain strainers, domes, and traps. Remove dirt and debris.

3.13 PROTECTION

A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION 221310

SECTION 22 13 13

FACILITY SANITARY SEWERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.

2. Cleanouts.

1.3 REFERENCED STANDARDS

A. New York State Department of Transportation (NYSDOT) "Standard Specifications" dated 2024, as amended.

B. ASTM D2321 – “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications”, as amended.

1.4 SUBMITTALS

A. General: Submit the following:

1. Product data for sanitary sewerage piping specialties. Product data for pipe materials, pipe fittings, and accessories. Provide manufacturer's catalog information.

2. Manufacturer's certificates.

3. Project record documents. As-built record drawings at project closeout of installed sanitary sewerage piping and products.

4. Operation and maintenance data.

5. Spare parts and maintenance materials.

6. Warranties.

1.5 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local health department and environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage.

C. All sanitary sewer system components shall be installed in accordance with applicable plumbing code requirements and in accordance with all license requirements.

D. All sanitary sewer construction shall be subject to inspection by the Engineer prior to backfilling.

E. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. National Sanitation Foundation (NSF).

2. Underwriters Laboratories (UL).

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewage system piping may be installed in compliance with original design and referenced standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the General Conditions.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate connection to existing sanitary sewer system.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated, selection is Installer's option.

B. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034; SDR-26 elastomeric gasket joints.

1. Gaskets: ASTM F 477, elastomeric seal

C. Pipe, couplings and fittings for building sewer laterals shall conform to the "Standard Specifications for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)," ASTM Designations D 2241-78, unless otherwise shown on the Drawings or specified. The above shall also conform to the dimensions and tolerances of Classification SDR-26. A PVC adapter shall be used to change the building service lateral pipe class from ASTM D3034-78 (SDR-35) to ASTM D 2241-78 (SDR-26), in a maximum laying length of 6.0 feet for use with standard gasketed pipe joints.

2.2 CLEANOUTS

A. General: See Contract Drawings.

2.3 CONCRETE AS CONTROLLED BACKFILL

A. General: Concrete for use in sewer trenches as controlled backfill shall conform to NYSDOT Standard Specification 08502.95. All other concrete shall conform to NYSDOT Standard Specification 500.

2.4 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION-SEWER LINE BURIED BELOW".

2.5 INSPECTION OF MATERIALS

A. The manufacturers of materials shall furnish the Engineer a Certificate of Inspection, certified by factory inspector, or reports of tests made by an independent testing laboratory, in three copies, showing that materials furnished conform to applicable specifications set out herein. Each inspection certificate or laboratory report shall identify the materials by number of pieces shipped and date of invoice.

B. A careful field inspection shall be made of all material before installation, and any material found to be damaged in shipment or not meeting the requirements of the Specifications will be rejected and replaced.

PART 3 EXECUTION

3.1 SURVEY, LINES, AND GRADES

A. The Contractor will be responsible for the proper execution of the work to the lines and grades established. The Contractor is to retain the services of a New York State Licensed Land Surveyor to provide stakeout of lines and grades per the Engineer's Design.

B. The Contractor shall take every precaution to protect all stakes and should replacement become necessary, it shall be done at the Contractor's expense. The Contractor shall also furnish for himself such lines and grades that he may need for construction purposes, including blue top grade stakes.

C. Setting of grade by use of a laser instrument or device is required. Laser instruments shall be used in accordance with manufacturer's recommendations.

D. The Contractor will maintain an adequate power supply and provide continuous power ventilation in the pipe line in accordance with the laser equipment manufacturer's recommendations as directed whenever the laser equipment is in use.

E. The adjustment of the laser equipment for accuracy shall be made by qualified personnel using surveying instruments at the start of each day's pipe laying and at any time during the day deemed necessary by the Engineer to assure accuracy of the laser equipment.

F. It is the Contractor's sole responsibility for the accuracy of the laser equipment, and any section of pipe found to be at the wrong grade or to have settled shall be dug up and relaid to the satisfaction of the Engineer at the Contractor's sole expense.

G. As-built elevations shall be established by the Contractor at each fitting and furnished to the Engineer.

3.2 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWER SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with pipe zone bedding and backfill material as indicated on the Contract Drawings.

C. Remove rock to a minimum depth of eight inches, or as deemed necessary by Engineer, at the surface upon which pipes are to be laid, and backfill with pipe zone bedding and backfill material as indicated on the Contract Drawings.

D. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped pipe zone bedding and backfill material. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.3 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWER SYSTEMS

A. Pipe Sizes 15 Inches and Smaller: PVC gasket joint sewer pipe and fittings.

3.4 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system and water service piping. Location and arrangement of piping layout take into account many design

considerations. Install the piping as indicated, to the extent practical. If, during construction of the project, it becomes necessary to make changes in the location or grades of the sewers, the Engineer will issue appropriate directions after being contacted by the Contractor.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.

3.5 SEWER RELATION TO WATER MAINS

A. Horizontal Separation: Whenever possible, sewers should be laid at least 10 feet, horizontally, from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main if:

1. It is laid in a separate trench, or;

2. It is laid in the same trench with the water mains located at one side on a bench of undisturbed earth, and if;

3. In either case the elevation of the top (crown) of the sewer is at least 18" below the bottom invert of the water main.

B. Vertical Separation: Whenever sewers must cross water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18" below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with push-on joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

C. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of a slip-on or mechanical-joint ductile iron pipe, and the sewer constructed of mechanical-joint ductile iron pipe and both pressure tested to assure water tightness.

3.6 SEWER RELATION TO OTHER UTILITIES AND OBSTRUCTIONS

A. In addition to the requirements regarding sewer relation to water mains and other requirements of these Specifications, there shall be at least a vertical separation with other utilities or other obstructions of 6”. Approved granular material such as crushed stone, sand, etc. shall be placed between the two objects unless the Engineer specifies concrete

encasement. If the required 6” cannot be attained, the Engineer and respective utility companies shall be notified.

3.7 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. Join and install PVC pipe as follows:

1. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212.

2. Installation in accordance with ASTM D 2321.

B. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.8 CLEANOUTS

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated on the Contract Drawings.

3.9 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the 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, as indicated on the Contract Drawings.

C. Protect existing piping to prevent debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground warning tape during backfilling of trench for underground sanitary sewer piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.11 FIELD QUALITY CONTROL

A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

B. Place plugs in ends of uncompleted pipe at the end of the day or whenever work stops.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

3.12 TESTING OF SEWER MAINS AND SANITARY SEWER STRUCTURES

A. All new sanitary sewer lines shall pass a low-pressure air test in accordance with ASTM C828, latest edition at a pressure of 3.5 psi.

B. All new sanitary sewer lines shall pass a deflection test, as indicated in Section 3.15 in accordance with “Recommended Standards For Waste Water Facilities”.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 223000

WATER HEATERS

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 DESCRIPTION OF WORK

A. Extent of water heater work required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Refer to other Division-22 sections for water piping, specialties, pumps, piping and components, which are required external to water heaters for installation; not work of this section.

C. Refer to other Division-22 sections for field installed automatic temperature controls required in conjunction with water heaters; not work of this section.

D. Electrical Work: Refer to Division-22 section "Electrical Provisions of Plumbing Work" for requirements.

E. Electrical Work: Provide the following wiring as work of this section, in accordance with requirements of Division 26:

1. Low voltage wiring between water heaters and remote mounted thermostats and controls. Provide factory-mounted and factory-wired controls and electrical devices as specified in this section.

F. Refer to Division-26 sections for other electrical wiring including motor starters, disconnects, wires/cables, raceways, and other required electrical devices; not work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of water heaters of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. UL Compliances: Construct water heaters in accordance with the following UL standards:

C. Provide water heater components which are UL-listed and labeled.

D. NSF Compliance: Construct and install water heaters located in food service establishments in accordance with NSF 5, "Standard for Hot Water Generating Equipment for Food Service Establishments using Spray Type Dishwashing Machines".

E. NEC Compliance: Install electric water heaters in accordance with requirements of NFPA 70, "National Electrical Code".

F. ASME Code Symbol Stamps: Provide water heaters and safety relief valves which comply with ASME Boiler and Pressure Vessel Code, and are stamped with appropriate code symbols.

G. Provide water heaters with Performance Efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in New Building Design".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data including rated capacities and efficiencies of selected model clearly indicated; operating weights; furnished specialties and accessories; and installation and start-up instructions. Submit manufacturer's assembly type shop drawings indicating dimensions, required clearances, and methods of assembly of components.

B. Wiring Diagrams: Submit manufacturer's electrical requirements for electrical power supply wiring to water heaters. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between portions of wiring that are factory-installed and portions that are to be field-installed.

C. Maintenance Data: Submit maintenance data and parts lists for each type and size of water heater, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle water heaters and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged water heaters or components; remove from site and replace with new.

B. Store water heaters and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading water heaters, and moving units to final location for installation.

1.6 SPECIAL PROJECT WARRANTY

A. Warranty on Coil, Heat Exchanger, and Burner: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, coils, heat exchangers, and burners with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty

period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

B. Warranty Period: 5 years from Date of Substantial Completion.

C. Warranty on Heat Exchanger and Burner: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within three-year warranty period, heat exchangers with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

D. Warranty on Tank: Provide written warranty, signed by the manufacturer, agreeing to replace/repair tank on a ten-year pro-rated basis, as outlined by manufacturer.

E. Warranty on Burner and Controls: Provide one-year cost free service policy on defective parts, as outlined by the manufacturer.

PART 2 PRODUCTS

2.1 COMMERCIAL WATER TO WATER HEAT PUMP WATER HEATER

A. General: Provide water source heat pump water heaters of sizes, capacities, and electrical characteristics as indicated on schedule on Plumbing drawings.

1. Up to 160°F maximum water temperature
2. • Ambient operating range of 40-120°F
3. • Absorbs heat from water sources including process and ground-water
4. • Environmentally-friendly R134a refrigerant
5. • Double wall condenser for potable water heating
6. • Integrated potable water-approved pump
7. • Suitable for indoor and outdoor applications
8. • BACnet compatible logic controller optional
9. Provide 5 year extended warrantee.

B. Manufacturers: Subject to compliance with requirements, provide commercial electric water heaters of one of the following:

1. Smith Corp (A.O.); Consumer Products Div.
2. Bradford White.
3. PVI.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. General: Provide commercial electric water heaters of sizes, capacities, and electrical characteristics as indicated on schedule.

B. Heater: Working pressure of 150 PSI, magnesium anode rod; glass lining on internal surfaces exposed to water.

C. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath, thermostat stepped through magnetic contactors.

D. Safety Controls: Double pole, manual reset, high limit; probe type electric low water cutoff; both factory wired.

E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin-proof glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.

F. Accessories: Provide brass drain valve; 3/4" temperature and pressure relief valve; ASME tank construction for 125 PSI working pressure; and 4" x 6" hand hole cleanout.

G. Controls: Adjustable immersion thermostat; power circuit fusing; pilot light and switch controlling control circuit; 3-stage time delay sequencer; and 7-day time clock.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering commercial electric water heaters which may be incorporated in the work include, but are not limited to, the following:

I. Manufacturers: Subject to compliance with requirements, provide commercial electric water heaters of one of the following:

1. Smith Corp (A.O.); Consumer Products Div.

2. Bradford White.

3. Rheem Water Heater Div; City Investing Co.

4. Ruud Water Heater Div; City Investing Co.

2.3 STORAGE TANK

A. General: Provide storage tank of size, capacity, and orientation (vertical or horizontal) as indicated on the Plumbing drawings.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering water heaters which may be incorporated in the work include, but are not limited to, the following:

1. A.O Smith; Consumer Products Div.

2. PVI Industries, Inc.

3. Patterson-Kelley Co.; Div. of Harsco Corp.

2.4 EXPANSION TANK :

A. General: Provide steel shell, 55 psi pre-pressurized air chamber, heavy duty butyl diaphragm with polypropylene liner. Maximum working PSI 100.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering expansion tanks which may be incorporated in the work include, but are not limited to the following:

2. Wessels.
3. Amtrol Inc.
4. Taco Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which water heaters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF WATER HEATERS

A. General: Install water heaters in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Support: Place units on concrete pads, orient so controls and devices needing service and maintenance have adequate access.

C. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closest floor drain, or as indicated.

D. Gages: Provide thermometers on inlet and outlet piping of water heaters, in accordance with Basic Mechanical Materials and Methods Section "Meters and Gages."

E. Electric Water Heaters:

F. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

G. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with water heater start-up until wiring installation is acceptable to water heater Installer.

H. General: Install pipe heat tracing system in accordance with the manufacturer's installation instructions.

I. Installation: Installation shall be performed after the hot, cold water supply and condensate drain systems have been successfully pressure tested and before the insulation is installed. Run heater linearly along pipes lower quadrant and secure with cable ties or fiberglass tape. Apply "Electrically Traced" signs to outside of thermal insulation.

J. Testing: Prior to shipment, submit the entire heater to inspection and a high-frequency spark test and all braided product to a dry dielectric test. After installation and before installing thermal insulation, test heater using a 1,000 VDC megger. Minimum insulation resistance should be between 20 and 1,000 megohms.

3.3 FIELD QUALITY CONTROL

A. Start-up: Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

3.4 CLOSEOUT PROCEDURES

A. Training: Provide services of manufacturer's technical representative for l-half day to instruct Owner's personnel in operation and maintenance of water heaters.

B. Schedule training with Owner, provide at least 7-day notice to (Sub)Contractor and Engineer of training date.

END OF SECTION 223000

SECTION 224200

PLUMBING FIXTURES

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 plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 10 Section "Service Wall Systems" for wall modules with built-in plumbing fixtures.
2. Division 22 Section "Valves" for valves used as supply stops.
3. Division 22 Section "Sanitary Waste Interceptors" for hair, sediment, and grease interceptors and grease recovery units.

C. Products furnished but not installed under this Section include:

1. Plumbing fittings (including faucets) and piping indicated, for fixtures, appliances, appurtenances, and equipment provided by Owner.
2. Plumbing fittings (including faucets) and piping indicated, for fixtures, appliances, appurtenances, and equipment specified in other sections.

D. Products installed but not furnished under this Section include:

1. Owner-supplied fixtures, as indicated.
2. Accessories, appliances, appurtenances, and equipment specified in other sections, requiring plumbing services or fixture-related devices, as indicated.

1.3 DEFINITIONS

A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.

B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.

C. Appliance: Device or machine designed and intended to perform a specific function.

D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.

E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.

F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.

G. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.

H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:

1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.

2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.

3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.

4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.

J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

C. Wiring diagrams for field-installed wiring of electrically operated units.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of ANSI Standard ICC/A117.1-2017, "Accessible and Usable Buildings and Facilities" with respect to plumbing fixtures for the physically handicapped.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in a dry location.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Faucet Washers and O-rings: Furnish quantity of identical units not less than 10 percent of amount of each installed.

2. Faucet Cartridges and O-rings: Furnish quantity of identical units not less than 5 percent of amount of each installed.

3. Flushometer Repair Kits: Furnish quantity of identical units not less than 10 percent of amount of each flushometer installed.

4. Provide a hinged-top wood or metal box, or individual metal boxes, having a separate compartment for each type and size of above extra materials.

5. Water Closet Tank Repair Kits: Furnish quantity of identical flush valve units not less than 5 percent of amount of each type installed.

6. Toilet Seats: Furnish quantity of identical units not less than 5 percent of amount of each type toilet seat installed.

7. Filter Cartridges: Furnish quantity of identical filter cartridges not less than 50 percent of amount of each type and size installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Water Closets:
    a. American Standard Brand.
    b. Barclay Products Ltd.
    c. Briggs Plumbing.
    d. Crane Plumbing/American Standard Brand.
    e. Eljer/American Standard Brand.
    f. Gerber Plumbing Fixtures LLC.
    g. Kohler Co.
    h. Mansfield Plumbing Products, Inc.
    i. Universal-Rundle Corp.
2. Urinals:
    a. American Standard Brand.
    b. Briggs Plumbing.
    c. Crane Plumbing/American Standard Brands.
    d. Eljer/American Standard Brand.
    e. Gerber Plumbing Fixtures, LLC.
    f. Kohler Co.
    g. Mansfield Plumbing Products, Inc.
    h. Universal-Rundle Corp.
3. Lavatories:
    a. Acorn Engineering Co.
    b. American Standard Brand.
    c. Barclay Products Ltd.
    d. Briggs Plumbing.
    e. Crane Plumbing/American Standard Brands.
    f. Eljer/American Standard Brand.
    g. Gerber Plumbing Fixtures, LLC.
    h. Just Manufacturing Co.
    i. Kohler Co.
    j. Mansfield Plumbing Products, Inc.
    k. Universal-Rundle Corp.
4. Sinks:
    a. American Standard Brand.

b. Briggs Plumbing.
c. Crane Plumbing/American Standard Brands.
d. Eljer/American Standard Brand.
e. Elkay Manufacturing Co.
f. Just Manufacturing Co.
g. Kohler Co.
h. Moen Incorporated.
i. Universal-Rundle Corp.

5. Mop Basins:
   a. Crane Plumbing/American Standard Brands.
   b. Fiat Products/American Standard Brands.
   c. Florestone Products Co., Inc.
   d. Stern-Williams Co., Inc.
   e. Swan Corp.
6. Showers:
   a. Acorn Engineering Co.
   b. American Standard Brand.
   c. Aquarius Bathware/A Praxis Company.
   d. Bradley Corp.
   e. Crane Plumbing/American Standard Brands.
   f. Eljer/American Standard Brand.
   g. Fiat Products/American Standard Brands.
   h. Kohler Co.
   i. Swan Corp.
   j. Universal-Rundle Corp.
7. Water Coolers:
   a. Elkay Manufacturing Co.
   b. Filtrine Manufacturing Co.
   c. Halsey Taylor.
   d. Haws/A Traynor Family Enterprise.
   e. Murdock Manufacturing, Inc.
8. Outlet Boxes:
   a. Guy Gray/IPS Corporation.
   b. Symmons Industries, Inc.
9. Emergency Equipment:

a. Bradley Corp.
b. Encon Safety Products, Inc..
c. Guardian Equipment.
d. Haws/A Traynor Family Enterprise
e. Speakman Co.
f. Water Saver Faucet Co.

10. Toilet Seats:
    a. Bemis Mfg. Co.
    b. Church Seat Co.
    c. Kohler Co.
    d. Olsonite Corp.
11. Flushometers:
    a. Cambridge Brass.
    b. Delany Products.
    c. Sloan Valve Co.
    d. Hydrotek International Inc.
    e. Zurn Industries, LLC.
12. Commercial/Industrial Cast-Brass Faucets:
    a. American Standard Brand.
    b. Briggs Plumbing.
    c. Chicago Faucet Co.
    d. Crane Plumbing/American Standard Brand.
    e. Eljer/American Standard Brand.
    f. Fisher Manufacturing Co.
    g. Grohe America, Inc.
    h. Kohler Co.
    i. Speakman Co.
    j. T & S Brass and Bronze Works, Inc.
13. Thermostatic Mixing Valve Bath/Shower Faucets:
    a. Bradley Corp.
    b. Grohe America, Inc.
    c. Lawler Manufacturing Co., Inc.
    d. Leonard Valve Co.
    e. Powers/A Watts Brand.
    f. Symmons Industries, Inc.

g. T & S Brass and Bronze Works, Inc.

14. Sensor-Operated Faucets and Devices:
    a. Acorn Engineering Co.
    b. Bradley Corp.
    c. Delany Products.
    d. Hydrotek International Inc.
    e. Sloan Valve Co.
    f. Speakman Co.
15. Miscellaneous Fittings (Except Faucets):
    a. Brass Craft Manufacturing Company.
    b. Central Brass/Pioneer Industries, Inc.
    c. Chicago Faucet Co.
    d. Crane Plumbing/American Standard Brand.
    e. Eljer/American Standard Brand.
    f. Kohler Co.
    g. McGuire Manufacturing Co., Inc.
    h. Pfister/Spectrum Brands.
    i. T & S Brass and Bronze Works, Inc.
16. Supports:
    a. Josam Co.
    b. Jay R. Smith Mfg. Co.
    c. Wade Div.; McWane Inc.
    d. Ancon, Inc.
    e. Zurn Industries, LLC.
17. Sanitary Joint Sealant:
    a. Pecora Corp.
    b. GE Silicone: Sanitary 1700

2.2 PLUMBING FIXTURES, GENERAL

A. Provide plumbing fixtures and trim, fittings, other components, and supports as specified in "Plumbing Fixture Schedule on the plumbing drawings.

2.3 FITTINGS, EXCEPT FAUCETS

A. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.

B. Lavatory Supplies and Stops: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 3/8-inch by 12-inch flexible tubing riser outlet.

C. Lavatory Traps: Cast-brass, 1-1/4-by 1-1/2-inch NPS adjustable P-trap with cleanout, 1-1/2-inch NPS nipple to wall, and wall flange.

D. Sink Supplies and Stops: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet.

E. Sink Traps, Type 1: Cast-brass, 1-1/2-inch NPS adjustable P-trap with cleanout, 17-gauge tubular waste to wall, and wall flange.

F. Water Closet Supplies and Stops, Type 1: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet with collar.

G. Water Closet Supplies and Stops, Type 2: Wheel handle angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet with collar.

H. Supply and drain plumbing service fittings not listed above shall be as specified and as scheduled.

I. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.

J. Escutcheons: Wall flange with set screw.

K. Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips, of depth adequate to conceal protruding roughing-in fittings.

L. Provide fittings specified as part of a fixture description, in lieu of fitting requirements above.

2.4 FLUSHOMETERS

A. Provide flushometers compatible with fixtures, with features and of consumption indicated on Plumbing Fixture Schedule.

2.5 TOILET SEATS

A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated on Plumbing Fixture Schedule.

2.6 EMERGENCY EYE/FACEWASH

A. Emergency Eyewash: ANSI Z358.1, wall-mounted; polished chrome-plated, cast brass; stay-open ball valve with push handle; adjustable regulated stream control; twin chrome-plated brass anti-surge heads; 1/2" NPS inlet.

2.7 PLUMBING FIXTURE SUPPORTS

A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

B. Support categories are:

1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gauge with carriers for wall-hanging water closets.

2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.

3. Chair Carriers, Heavy Duty: Supports with rectangular steel uprights for wall-hanging fixtures.

4. Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

C. Support Types: Provide support of category specified, of type having features required to match fixture.

D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

2.8 SANITARY JOINT SEALANT

A. One-part, Mildew-resistant Silicone Sealant:. Manufacturer's standard, non-modified, single component, acid-curing, silicone sealant. Sealant shall comply with ASTM C920, Type S, Grade NS, Class 25, Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, Use O. Sealant shall be formulated with fungicide and specifically intended for sealing interior joints with non-porous substrates and subject to in-service exposure to high humidity and temperature extremes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:

1. Carriers for following fixtures:

a. Wall-hanging water closets.

b. Wall-hanging fixtures supported from wall construction.

2. Chair carriers for the following fixtures:
    a. Wall-hanging urinals.
    b. Wall-hanging lavatories and sinks.
    c. Wall-hanging drinking fountains and electric water coolers.
3. Heavy-duty chair carriers for the following fixtures:
    a. Accessible lavatories.
    b. Fixtures where specified.
4. Reinforcement for the following fixtures:
    a. Floor-mounted lavatories required to be secured to wall.
    b. Floor-mounted sinks required to be secured to wall.
    c. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.

B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gauge.

E. Install wall-hanging, back-outlet urinals with gasket seals.

F. At accessible water closets and urinals, install flush valves with handles oriented toward approach side of stall.

G. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

H. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

I. Fasten wall-mounted fittings to reinforcement built into walls.

J. Fasten counter-mounting-type plumbing fixtures to casework.

K. Secure supplies behind wall or within wall pipe space, providing rigid installation.

L. Set shower receptors and mop basins in leveling bed of cement grout.

M. Install stop valve in an accessible location in each water supply to each fixture.

N. Install trap on fixture outlet except for fixtures having integral trap.

O. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.

P. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in Division 7 Section "Joint Sealers." Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.

2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.

D. Replace washers of leaking and dripping faucets and stops.

E. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

F. Review the data in Operating and Maintenance Manuals. Refer to Division 1 Section "Project Closeout."

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

3.8 ROUGH-IN SCHEDULE

FIXTURE	HOT WATER	COLD WATER	WASTE	VENT
Lavatory	1/2"	1/2"	1-1/2"	1-1/2"
Urinal	-	3/4"	2"	1-1/2"
Flush Valve Water Closet	-	1"	4"	2"
Sink	1/2"	1/2"	1-1/2"	1-1/2"
Mop Basin	1/2"	1/2"	3"	1-1/2"
Shower	1/2"	1/2"	2"	1-1/2"
Water Cooler	-	1/2"	1-1/2"	1-1/2"

3.9 MOUNTING HEIGHTS SCHEDULE

FIXTURE	MOUNTING HEIGHT
Lavatory	32" floor to rim
Handicapped Accessible Lavatory	34" floor to rim
Water Closet	15" floor to rim
Handicapped Accessible Water Closet	17" floor to rim
Urinal	24" floor to lip
Handicapped Accessible Urinal	17" floor to lip
Water Cooler	36" floor to orifice of low side bubbler

END OF SECTION 224200

SECTION 230000

SCOPE OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All work under this title, on drawings or specified, is subject to the architectural general and special contract conditions for the entire project, and the contractor for this portion of the work is required to refer especially thereto, and to the architectural drawings.

1.2 SCOPE OF WORK

A. The following is a general listing of work items to be provided under this Contract. Work indicated is not necessarily all inclusive**,** nor shall it limit the extent of the work or exclude any work shown or specified and not listed.

B. This Contractor shall refer to Division 1 for additional scope items required by Contract including but not limited to the section listed as "Summary of Work, Multiple Prime Contracts".

C. Contractor shall furnish all materials, equipment and labor to make the following complete installations:

1. Mechanical identification as required by the specifications including but not limited to pipe identification, duct identification and equipment identification.

2. Sleeves and plates including fire stop material.

3. Cutting and patching required to accomplish the work indicated including painting and finish work.

4. Pipe, fittings, hangers, supports, core drilling, anchors, valves, piping specialties and accessories required to make complete installation of heat pump water supply and return, glycol and cooling condensate piping systems.

5. Vibration isolators and accessories.

6. Circulating pumps complete with motors and accessories.

7. Complete hydronic air control system including but not limited to air separators, expansion tanks, automatic and manual air vents.

8. Energy recovery ventilators complete with fans, motors, coil sections, dampers, energy wheel, filters, controls and all accessories.

9. Air-cooled computer room air conditioning units including but not limited to indoor down-flow units with return air extension, fans, motors, compressors, coils, filters, humidification, floor stand, outdoor grade mounted condensing units, fans, motors, controls and accessories.

10. Water to air heat pumps including but not limited to fans, motors, compressors, coils, filters, controls and accessories.

11. Water to water heat pumps including compressors, controls and accessories.

12. Cabinet heaters and unit heaters complete with fans, coil, casing, motors, filters, controls and accessories.
13. Diffusers, registers and grilles complete with dampers and accessories.
14. Gravity intake roof ventilator complete with screens, curb and accessories.
15. Inline exhaust fans complete with motors, speed controllers and accessories.
16. Ductwork to include galvanized sheetmetal to service outside, supply and return and exhaust air duct systems complete with flexible duct and flexible connectors, air control devices, fire dampers, access doors and accessories.
17. VAV boxes including controls and accessories.
18. Thermometers and pressure gauges including wells and accessories.
19. Thermal and acoustic insulations to service piping and ductwork complete with pins, jackets, adhesive, tape and accessories.
20. Provide motor controls and motor starters for all HVAC equipment.
21. Electric/electronic/DDC temperature controls to serve all heating, ventilating and air conditioning equipment installed, complete with dampers, motor actuators, controllers, wiring systems and all accessories.
22. Testing, start-up and balancing of all heating, ventilating and air conditioning installations to include sheetmetal ductwork, air handling supply, return and exhaust systems, heating and cooling systems and temperature control systems.
23. Servicing of heating, ventilating and air conditioning equipment installed as required during guarantee period for a minimum of 1 year after Owner’s acceptance.
24. Provide competent factory-trained personnel at site for the purpose of instructing Owner's personnel in proper operation and maintenance of all new HVAC facilities.

END OF SECTION 230000

SECTION 230500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PLANS AND SPECIFICATIONS

A. All work under this title, on drawings or specified, is subject to the general and special contract conditions for the entire project, and the contractor for this portion of the work is required to refer especially thereto, and to the architectural drawings.

B. Drawings are diagrammatic in nature and specifications are complementary and must be so interpreted to determine the full scope of work under this heading. Wherever any material, article, operation or method is either specified or shown on the drawings, this contractor is required to provide each item and perform each prescribed operation according to the designate quality, qualification or condition, furnishing all necessary labor, equipment or incidentals.

C. Wherever the designation "Architect" appears, it shall imply Architect or Engineer. Wherever the term "Contractor" or "HC" appears, it shall imply the Contractor responsible for Division 23, HVAC work.

1.3 CONFLICTS

A. If, in the interpretation of contract documents, it appears that the drawings and specifications are not in agreement, the Contractor is to contact the Engineer. The Engineer shall be the final authority. Addenda supersede the provisions which they amend.

B. In the absence of a written clarification by the engineer, the Contractor must install his work in accordance with the more stringent and/or costly condition. Contractor assumes full responsibility for any and all items furnished and installed without the written approval by the Architect or Engineer. Under no circumstances will a change order be accepted for work installed that was not approved by the Architect or Engineer.

1.4 DIMENSIONS, LAYOUTS AND OBSTACLES

A. Verify dimensions and elevations from actual field measurements after building construction has sufficiently progressed.

B. Assume full and final responsibility for the accuracy of any or all work performed under this Division and make repairs and corrections as required or directed at no extra cost to the Owner.

C. Layouts of piping, ductwork, and equipment shown on drawings are diagrammatic and shall be construed as such. **DO NOT SCALE DRAWINGS.** Contractor shall field verify all existing conditions prior to fabrication and installation of material. It is recommended that the contractor verify all existing conditions prior to submitting a proposal. Lack of field verification does not constitute a basis for additional monies during construction. Contractor assumes full responsibility for completeness of installation including coordination of work with other trades.

D. Make actual installations in accord with said layouts, but with necessary deviations as directed or required by job conditions and field measurements in order to produce a thoroughly integrated and practical job upon completing, but make deviations only with specific approval of the Engineer/Architect.

E. Take particular care to coordinate all piping and ductwork under this Division to prevent conflict and remove and relocate work as may be made necessary by such conflict at no extra cost to the Owner.

F. Unless expressly permitted by the Engineer/Architect or shown otherwise on the Drawings, all piping, ducts and similar items shall be installed so that they are concealed except as permitted by the Engineer/Architect in service rooms noted on the Drawings.

G. The Owner or Owner's Representative reserves the right to relocate terminal equipment six (6) feet in any direction from locations indicated on plans, before roughing-in, with no change in contract price.

1.5 REVIEW OF MATERIAL

A. Items specified have been checked by the Engineer for performance and space limitation.

B. In order for Engineer to consider "equal", HC must certify by letter that he has checked the product for conformance to specifications and space limitations and assumes full responsibility thereafter.

C. Engineer, not Contractor or Vendor, shall be the final judge of equal materials.

D. Substitutions are defined as any manufacturer and/or model not indicated in drawings or specifications. Requests for substitutions must be made in writing ten (10) days prior to bid date so that an addendum may reach all contractors.

E. If substitutions are proposed after the bids are received, the Contractor shall state amount of credit to the Owner for substitution. Substitutions that are considered equal by the Contractor and carried in bid without approval by Engineer shall be the responsibility of the Contractor. The Engineer and/or Owner shall not be made liable or responsible for losses incurred by the Contractor, due to the rejection of said items for installation.

F. Where equipment requiring different arrangement or connections other than as indicated is acceptable, it shall be the responsibility of this Contractor to furnish revised layouts and install the equipment to operate properly and in harmony with the intent of the drawings and specifications. All changes in the work required by the different arrangement shall be done at no additional cost to the Owner, including but not limited to structural steel modifications. Control and power wiring modifications required by Contractor, imposed modifications, and the additional cost of these modifications, shall be the responsibility of this Contractor.

G. Upon review of equipment list by Engineer, copies of submittal prints shall be forwarded to Engineer within 30 days.

1.6 PERMITS, CODES AND ORDINANCES

A. The Heating Contractor shall arrange and pay for all permits, inspections, etc., as required by local utilities or applicable agencies.

B. All work and material shall be in complete accordance with the ordinances, regulations, codes, etc., of all political entities exercising jurisdictions, specifically including the NYS Energy Code and NYS stretch code.

1.7 COORDINATION WITH OTHER TRADES

A. Check Division 23 drawings with all others.

B. Anticipate and avoid interferences with other trades.

C. Take particular care to coordinate all piping, ductwork, plumbing and major electrical components above ceiling, to prevent conflict. Remove and relocate work as may be made necessary by such conflict, at no extra cost to the Owner. The use of coordination drawings is recommended but may not be required (refer to Division 1 for additional requirements). Lack of coordination drawings assumes contractor has verified and coordinated all work associated with installation.

D. Obtain decision for approval from project Engineer for proposed group installation before proceeding, and for clearance in structure and finish of the building.

E. Verify with drawings all ductwork and equipment layout in concealed areas.

F. Running pipe and ductwork over electrical equipment rooms is prohibited.

G. The Contractor to coordinate with, receive and install, Owner furnished equipment where indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Make provisions for delivery and safe storage of all materials. Check and properly receipt material to be "furnished by others" to contractor, and assume full responsibility for all materials while in storage with full visible identification and information.

1.9 SUBMITTALS

A. Shop Drawings and Product Data: Submit shop drawings, wiring diagrams and/or equipment list for the following equipment and material.

1. Submit a list of the following sub-contractors

a. Sheet Metal

b. Piping

c. Insulation

d. Temperature Controls

e. Balancing - air and water procedures

B. Required Shop Drawings

SECTION	MATERIAL ITEM
230506	PENETRATION FIRESTOPPING HVAC
230512	MOTOR CONTROLS
230514	VARIABLE FREQUENCY DRIVES
230523	VALVES
230529	PIPE HANGERS AND SUPPORTS
230549	SEISMIC RESTRAINTS
230549	CONCRETE PADS FOR EQUIPMENT
230553	PIPE AND VALVE IDENTIFICATION
230554	DUCT AND EQUIPMENT IDENTIFICATION
230550	CLEANING AND TESTING
230594	BALANCING OF SYSTEMS
230713	DUCT INSULATION
230719	PIPING AND EQUIPMENT INSULATION
230865	EXHAUST FANS
230923	DIRECT DIGITAL CONTROL SYSTEM FOR HVAC
230993	SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
232000	HVAC PIPING
232006	HYDRONIC SPECIALTIES
232123	PUMPS
232515	GLYCOL FEED SYSTEM
233113	METAL DUCTWORK
233300	DUCTWORK ACCESSORIES
233616	VARIABLE AIR VOLUME UNITS
233713	DIFFUSERS, REGISTER, AND GRILLES
233723	ROOF VENTILATORS
233730	LOUVERS
235413	ELECTRIC CABINET HEATERS
235415	ELECTRIC UNIT HEATERS
237313	ENERGY RECOVERY VENTILATOR
238124	AIR CONDITIONERS - COMPUTER ROOM
238146	WATER SOURCE UNITARY HEAT PUMPS
238147	WATER TO WATER HEAT PUMP

238429	SELF-CONTAINED HUMIDIFIER

1.10 MISCELLANEOUS SUPPORT

A. Mechanical Contractor is responsible for providing all miscellaneous support components necessary for properly supporting equipment provided by Mechanical Contractor including hangers, rods, anchors, steel, etc.

1.11 REQUIREMENTS BEFORE FINAL PAYMENT

A. Lubricating Instruction

1. Hang framed lubrication chart in Mechanical Room or adjacent to equipment installed by the Contractor.

2. List name of equipment, recommended lubrication, and times required.

3. Certify all equipment has been properly lubricated prior to turnover to Owner.

B. Identification

1. Tag all starters, etc., per Section 230553, "Pipe and Valve Identification" and Section 230554, "Duct and Equipment Identification."

2. Hang typewritten list in equipment rooms where directed.

C. Certification

1. Submit to Engineer/Architect certificates of approval from electrical inspector or authority having jurisdiction over codes pertaining to work in this Division.

2. Submit to Engineer/Architect certificate stating any refrigerant on the project has been handled and disposed of in accordance with EPA regulations.

D. Instructional Period: Instruct Owner's representatives in complete operation of all components, to the satisfaction of the Owner and receive signed statement from Owner's representative certifying knowledge and understanding of all equipment and systems.

E. Guarantees: Provide all guarantees as required by the Contract Documents with a minimum of one year from the date of Substantial Completion on all labor and materials.

F. Start-up Report

1. Provide start-up report for each piece of mechanical equipment including date, electrical characteristics, temperature and pressure readings, etc.

2. This is intended for all items not specifically included in the Balancing Report.

G. Punch List signoffs

1. Punch lists and/or Observation Reports developed by the architect or engineer listing deficiencies shall be reviewed by the Contractor.

2. Items requiring corrective measures shall be completed and signed of as such by the contractor.

3. After all items have been corrected and initialed, the report shall be returned to the architect or engineer.

H. Operational Booklets (Maintenance Manuals)

1. Provide the Owner with two Operation Booklets which contain the following:
   a. Acceptable shop drawings and submittals
   b. Wiring diagrams
   c. Installation & Maintenance Instructions
   d. List of suppliers for all equipment provided including name, address and telephone numbers.
   e. Test data
   f. Operational instructions
   g. Lubrication instructions
   h. Start-up report
   i. Balancing report (Air and Water)
   j. As-built drawings

END OF SECTION 230500

SECTION 230505

CUTTING AND PATCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

A. Provide cutting and patching work required by work of this (sub) contract.

B. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decreased structural integrity, decreased integrity of fire proofing, decreased energy performance, increased maintenance, decreased operational life or decreased safety. Specific attention shall be paid to the 2015 International Building Code as adopted by New York State, including Chapter 23 with regard to boring and notching of wood structural members.

C. Requirements in this Section apply to mechanical, plumbing and electrical installations. Refer to Divisions 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations. Requirements of this section shall be coordinated with requirements of Division 1 sections. In the event of conflict, the more stringent requirements shall be used.

1.3 DEFINITIONS

A. Cutting: Removal of previously installed construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. This is to include but not be limited to the following:

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire-protection systems.

4. Control systems.
5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
    a. Processed concrete finishes.
    b. Stonework and stone masonry.
    c. Ornamental metal.
    d. Matched-veneer woodwork.
    e. Preformed metal panels.
    f. Roofing.
    g. Firestopping.
    h. Window wall system.
    i. Stucco and ornamental plaster.
    j. Terrazzo.
    k. Finished wood flooring.
    l. Fluid-applied flooring.
    m. Aggregate wall coating.

n. Wall covering.

o. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 NON-FIRE RATED PENETRATIONS

A. Refer to Divisions 3 through 20.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

2. Fit work airtight to pipes, sleeves, ducts, conduits and other penetration through surfaces.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 230505

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230506

PENETRATION FIRESTOPPING HVAC

PART 1 GENERAL

1.1 REFERENCES

A. UL 1479 Fire Tests of Through-Penetration Firestops.

B. ASTM E 814 Method of Fire Tests of Through-Penetration Fire Stops.

1.2 DEFINITIONS

A. UL Fire Resistance Directory: Product directory published yearly, with supplements, by Underwriters Laboratories Inc., containing listings and classifications in effect as of the published date for product categories covered by UL.

B. Inchcape Directory of Listed Products: Product directory published yearly by Inchcape Testing Services containing listings which reflect certifications granted for materials, products, systems and equipment which have been tested by Inchcape Testing Services to recognized governing standards.

C. Omega Point Laboratories Listings Directory: Product Directory published yearly by Omega Point Laboratories, Inc. containing listed building products, materials, and assemblies which have been tested by Omega Point Laboratories to recognized governing standards.

D. Factory Mutual Approval Guide: Product directory published yearly, with supplements, by Factory Mutual Research Corp., containing listed building products, materials, and assemblies which have been tested by Factory Mutual Research Corp., to recognized governing standards.

E. F Rating: Prohibits flame passage through the system and requires acceptable hose stream test performance.

F. T Rating: Prohibits flame passage through the system and requires the maximum temperature rise on the unexposed surface of the wall or floor assembly, on the penetrating item and on the fill material not to exceed 325 degrees F above ambient, and requires acceptable hose stream test performance.

G. Company Field Advisor: An employee of the Company which lists and markets the primary components of the system under their name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation and servicing of the required products. Personnel involved solely in sales do not qualify.

1.3 DESIGN REQUIREMENTS

A. Devices and materials shall meet the hourly fire resistance ratings required by the Project as determined by UL 1479, or ASTM E 814 and be listed and detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. Exception: Where no listed designs exist that meet the requirements of a specific project condition, submit details and manufacturer's written recommendations for a design meeting the requirements. Include evidence of engineering judgement and extrapolation from listed designs.

1.4 SUBMITTALS

A. Submittals Package: Submit the following items specified below the same time as a package:

1. Product Data.

2. Samples.

3. Quality Control Submittals.

4. Firestop Schedule.

B. Product Data: Catalog sheets, specifications and installation instructions for each firestop device and material.

1. Indicate design number for each firestop proposed to be used which is detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

2. State the specific locations where each firestop system is proposed to be installed.

C. Samples: One of each product if requested.

D. Quality Control Submittals:

1. Design Data: Show details and include engineering information and manufacturer's written recommendations required under Design Requirements Article for each proposed firestop if other than a design detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

a. State the specific locations where each firestop is proposed to be installed.

2. Installer's Qualifications Data:

a. Name of each person who will be performing the Work and their employer's name, business address and telephone number.

b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

3. Company Field Advisor Data:

   a. Name, business address and telephone number of Company Field Advisor secured for the required services.

   b. Certified statement from the Company listing the qualifications of the Company Field Advisor, and listing of services and each product specifically listed for this Project for which Company Field Advisor is given authorization by the Company to render advice.

E. Firestop Schedule: Submit schedule itemizing the following:

1. Manufacturer's product reference numbers and/or drawing numbers.

2. UL, Inchcape Testing Services, Factory Mutual Research Corp., or Omega Point Lab design number.

3. Location of firestop material.

4. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.

5. Maximum allowable annular space or maximum size opening.

6. Wall type construction.

7. Floor type construction.

8. Hourly Fire resistance rating of wall or floor.

9. F rating.

10. T rating, if available.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: The persons installing the firestopping and their supervisor shall be personally experienced in firestop work and shall have been regularly employed by a company installing firestopping for a minimum of 3 years.

B. Pre-Installation Conference: Before the firestop work is scheduled to commence, a conference will be called by the Director's Representative at the Site for the purpose of reviewing the Contract Documents and discussing requirements for the Work. The conference shall be attended by related trade Contractors (if any), their qualified firestopping installers, and associated firestopping manufacturer's Company Field Advisors.

C. Container/Package Labels: Include manufacturer's name and identifying product number, date of manufacturer, lot number, shelf life (if applicable), qualified testing and inspecting agency classification marking, curing time, and mixing instructions for multi-component materials.

D. Company Field Advisor: Secure the services of a Company Field Advisor for the following:

1. Render advice regarding suitability of firestopping materials and methods.

2. Assist in completing firestop schedule.

3. Attend pre-installation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping materials to the Site in original, new unopened containers or packages bearing manufacturer's printed labels.

B. Store and handle firestopping materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, etc.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:

1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.

2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.

3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.8 SEQUENCING AND SCHEDULING

A. Leave exposed those firestopping installations that are to be concealed behind other construction until the Director's Representative has examined each installation.

PART 2 PRODUCTS

2.1 FIRESTOPPING-GENERAL

A. Through-Penetration Firestop Devices, Forming Materials, And Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. For firestopping exposed to moisture, furnish products that do not deteriorate when exposed to this condition.

2. For firestopping systems exposed to view, furnish products with flame-spread values of less than 25 and smoke developed values less than 50, as determined per ASTM E 84.

3. For penetrations for piping services below ambient temperature, furnish moisture-resistant through-penetration firestop systems.

4. For penetrations involving insulated piping, furnish through-penetration firestop systems not requiring removal of insulation.

B. Accessories: Components required to install fill materials as recommended by the firestopping manufacturer for particular approved fire rated system.

C. Identification Labels:

1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.

2. Identify the following:

a. "WARNING - FIRESTOP MATERIAL".

b. Company Name.

c. Product Catalog number.

d. F rating.

e. T rating, if available.

3. Field fabricated labels are not acceptable.

D. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing through-penetrations of floors, walls, partitions, ceilings and roofs in the Work areas.

B. Where firestopping is missing or not intact, submit a written report to the Director's Representative describing the existing conditions.

3.2 PREPARATION

A. Clean out openings immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove foreign materials from surfaces of openings, and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Protection:

1. Protect surfaces adjacent to through-penetration firestops with non-staining removable masking tape or other suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.

C. Substrate Priming:

1. Prime substrates in accordance with the firestopping manufacturer's printed installation instructions using recommended products and methods.

2. Do not allow primer to spill or migrate onto adjoining exposed surfaces.

3.3 INSTALLATION OF THROUGH PENETRATION FIRESTOPS

A. Use through-penetration firestop devices, forming materials, and fill, void or cavity materials to form through-penetration firestops to prevent the passage of flame, and limit temperature rise of the unexposed surface as detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.

1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form through-penetration firestop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.

2. If the construction type(s) of the building cannot be determined, provide firestopping with fire resistance ratings as specified in the Building Code of New York State, Tables 720.1(1), 720.1(2), 720.1(3), and 302.3.2. Insulated pipes - select a system where the pipe insulation is permitted to pass through the construction. Insulation shall conform the requirements of the firestop system UL listing.

3. Insulated ducts - insulation shall not extend through construction required to have a fire resistive rating.

4. Pipes, tubing, conduits, cables and other building services - provide an appropriate UL listed firestop system.

5. 5Ducts without a fire, or combination smoke/fire damper that penetrate a 1-hour rated wall - fill the annular space between the duct and the rated construction (both sides of the rated construction) with a non-hardening, intumescent, UL listed firestop product; and in the absence of manufacturer's firestop system installation instructions or Engineer's recommendation, attach 1½" angles around the perimeter of all ducts (both sides of the rated construction).

6. Ducts with a fire, or combination smoke/fire damper - caulk against the rated construction at the perimeter of the damper sleeve angle iron frame (both sides of the rated construction) with a non-hardening, intumescent, UL listed firestop product. Do not fill the annular space around the damper sleeve.

B. Provide through-penetration firestop systems with F ratings which shall equal or exceed the fire resistance rating of the penetrated building construction.

C. Provide through-penetration firestop systems with T ratings, in addition to F ratings, at floors where the following conditions exist:

1. Where firestop systems protect penetrations located outside the wall cavities.

2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.

3. Through-penetration firestop systems protecting floor penetrations require a T-rating of at least 1 hour, but not less than the required floor fire-resistance rating.

D. Firestop through-penetrations of floors, walls, partitions, ceilings, and roofs.

E. Firestop through-penetrations associated with the new Work.

F. Permanently affix label at each firestop. Use adhesive compatible with surface construction at firestop location.

3.4 CLEANING

A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

B. Remove masking tape as soon as practical so as not to disturb the firestopping's bond with substrate.

C. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

D. Cut out and remove damaged or deteriorated firestopping immediately, and install new materials as specified in firestop schedule.

END OF SECTION 230506

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230512

MOTOR 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 and Division 15 Specification Sections.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Variable Frequency Motor Controls: Section 230514

1.3 SCOPE OF WORK

A. Mechanical (Sub)Contractor (MC) shall furnish all motor controls, disconnect switches and starters as required by this contract.

B. MC shall be responsible for coordination of motor(s) with motor short circuit and overload protection device(s).

1. For motors and devices within this contract.
2. For motors within this contract and devices furnished by others (i.e., circuit breakers and/or fuses in panels furnished by the Electrical (Sub)Contractor (EC).
3. For compliance of the devices with the N.E.C.
4. To ensure device(s) is sufficient for the starting current of the motor(s).
5. All costs resulting from this coordination shall be borne by the MC and EC, as regards their own work.
    a. In the event of substitutions by the MC, all costs for revising attendant work by other trades shall be borne exclusively by the MC.

1.4 ACCEPTABLE STANDARDS

A. Cutler-Hammer

B. General Electric

C. Square D

D. Siemens

1. The starter manufacturer shall coordinate the starter with the motor actually to be installed.
2. Furnish enclosure type required for specific application and location.

3. UL listed and labeled.

4. Select motor overload protection based on actual motor nameplate data.

1.5 RELATED WORK SPECIFIED ELSEWHERE

A. Wiring of Mechanical Equipment: 230512

B. Common Motor Requirements: 230513

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's catalog sheets and specifications for all items.

B. All starters and disconnects required by this contract, whether for field installation or provided affixed to mechanical equipment (IE: Pumps, AHU's, RTU's, ETC) shall be of the same manufacturer. And shall comply with this specification.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

A. Starter Type "A": Starter type "A" shall be a manual single phase starter for fractional (1/2 hp and less) motors

1. NEMA 1 enclosure (NEMA 4X waterproof for outside use), 600 VAC rating.

2. Red run pilot Light.

3. Lockable handle guard.

4. Thermal overload protection.

5. Flush mounting with stainless steel faceplate in finished spaces.

6. Provide two-pole starter. Purpose is to allow control power to be disconnected.

7. Auxiliary N.O./N.C. contacts as required for control sequence.

B. Starter Type "B": Starter type "B" shall be a Combination Automatic Starter/Disconnect, full voltage, non-reversing, NEMA Size 0 (minimum) used for 3/4 hp to 30 hp three phase motors.

1. NEMA 1 enclosure (NEMA 4X waterproof for outside use), 600 VAC rating.

2. Motor Circuit Protector shall be NEMA AB1 circuit breaker with instantaneous magnetic trip in each pole. Coordinated field adjustable short circuit trip settings with the motor lock rotor nameplate amperage.

3. Hand-Off-Automatic selector switch.

4. Red run pilot light.

5. External operating handles with lock-open padlocking provisions and shall indicate the ON and OFF positions. Doors mechanically interlocked to prevent opening unless the breaker within the enclosure is open. If a separate control circuit is indicated, furnish disconnect/circuit breaker with auxiliary contacts.

6. Thermal overload relay for each phase with external manual reset.

7. Provide one N.O. holding contact, and additional N.O./N.C. auxiliary contacts as required for control sequence.

    a. For motors operating over 120 Volts phase to phase, incorporate a separate, heavy duty, control transformer with 120 Volt secondary, two primary fuses, one secondary fuse, and grounded secondary winding. Size with adequate capacity to operate connected pilot, indicating and control devices, including devices required by control sequence.

    b. Phase failure and undervoltage protection with relays set for 80% voltage drop

2.2 DISCONNECT SWITCHES

A. Non-fused disconnect switch for manual single phase fractional (1/2 hp and less) motors.

1. Toggle type in a NEMA 1 enclosure (NEMA 4X waterproof for outside use), 600 VAC rating.

2. Lockable handle guard.

B. Fused disconnect switch for single or multi-phase motors.

1. Blade type with pivot arm operating mechanism with fuses in a NEMA 1 enclosure (NEMA 4X waterproof for outside use), 600 VAC rating.

2. Lockable handle guard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mechanical (Sub)Contractor shall furnish to the Electrical (Sub)Contractor all Mechanical equipment motor starters and disconnect switches not factory mounted. Electrical Contractor to mount and wire. Manual starters used to disconnect power to controllers shall be installed within sight of controller, per NEC.

B. Use fused disconnect switches when required by the Mechanical equipment manufacturer and/or where indicated. Furnish fuse sizes as required by the Plumbing equipment manufacturer. Unless indicated otherwise, fuses shall be dual-element with 100,000 Ampere interrupting rating.

END OF SECTION 230512

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

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 1 Specification Sections, apply to this Section.

1.2 GENERAL

A. Specific motor requirements for mechanical equipment are scheduled on the drawings.

B. This section includes, but is not limited to, factory-installed motors furnished as an integral part of packaged mechanical equipment.

C. Motors shall conform to NEMA Standards MG1, Motors and Generators.

D. Motors shall comply with the National Electric Code.

E. Electrical components shall be UL labeled.

PART 2 - PRODUCTS

2.1 MOTORS

A. General: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

3. 2-speed motors shall have 2 separate windings on polyphase motors.

4. Temperature Rating: Rated for 104EF environment with maximum 122EF temperature rise for continuous duty at full load (Class A Insulation).

5. Service Factor: 1.15 poly-phase motors and 1.35 for single phase motors.

2.2 MOTOR CONSTRUCTION

A. NEMA Standard MG1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

1. Frames

a. NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

2. Bearings
   a. Ball or roller bearings with inner and outer shaft seals.
   b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
   c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
   d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
3. Enclosure Type
   a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
   b. Weather protected Type I for outdoor use, Type II where not housed.
4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
5. Efficiency: "Energy Efficient" motors shall have a minimum efficiency as scheduled in accordance with ANSI/IEEE 112-1984-IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.
6. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.
7. Motor Efficiency

MINIMUM NOMINAL FULL-LOAD MOTOR EFFICIENCY TABLE *

		OPEN MOTORS			CLOSED MOTORS		
HP	Poles	6	4	2	6	4	2
	RPM	1200	1800	3600	1200	1800	3600
1		82.5	85.5	77	82.5	85.5	77.0
1.5		86.5	86.5	84.0	87.5	86.5	84.0
2		87.5	86.5	85.5	88.5	86.5	85.5
3		88.5	89.5	85.5	89.5	89.5	86.5
5		89.5	89.5	86.5	89.5	89.5	88.5
7.5		90.2	91.0	88.5	91.0	91.7	89.5
10		91.7	91.7	89.5	91.0	91.7	90.2
15		91.7	93.0	90.2	91.7	92.4	91.0
20		92.4	93.0	91	91.7	93.0	91.0
25		93.0	93.6	91.7	93.0	93.6	91.7

* Efficiency is the ratio of useful output power to total input power expressed as a percent.

END OF SECTION 230513

SECTION 230514

VARIABLE FREQUENCY MOTOR 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 SCOPE OF WORK

A. The work to be performed shall include, but not be limited to:

1. Heating (Sub) Contractor (HC) shall furnish Variable Frequency Drives (VFD) as required by this contract.

a. HC shall be responsible for coordination of motor(s):

1) For motors and devices within this contract.

2) For compliance of the devices with the N.E.C.

3) To ensure device(s) is sufficient for the starting current of the motor(s).

4) All costs resulting from this coordination shall be borne by the HC and EC, as regards their own work.

a) In the event of substitutions by the HC, all costs for revising attendant work by other trades shall be borne exclusively by the HC.

1.3 QUALITY ASSURANCE

A. Provide equipment manufactured to NEMA standards. Equipment shall be UL listed and CSA certified.

B. All required components and or accessories shall be factor installed and tested and be UL listed by the drive manufacturer as a complete assembly. Any field installed components and or accessories will not be acceptable.

1.4 SUBMITTALS

A. Submit for approval shop drawings for drive units. Shop drawings to include:

1. Construction Techniques.

2. Operating characteristics: ie. torque speed characteristic curves vs load characteristics of the equipment requiring variable torque.

3. Conformance with applicable codes.

4. Manufacturer's methods of improving input power factor and harmonic suppression.

5. List of recommended spare parts, prices, nearest factory stock location and normal delivery time.

6. Test reports:

   a. Standard factory test results.

   b. Conformance with applicable code requirements.

   c. Efficiency curves for 0-100% speed in increments of 10% at 25%, 50%, 75%, 90% and 100 % loads.

   d. Test data outlined in Section 2.08.

   e. Total harmonic and single harmonic distortion figures for the line and load side of the drive under 100% loading.

7. Indicate application conditions and limitations of use.

8. Include instructions for storage, handling, protection, examination, preparation before installation and field testing.

9. Provide installation manuals/drawings (2 sets) for properly installing drives, and field programming.

10. Clearly indicate deviations from specified requirements.

11. The design of the drive shall permit its use without an isolation transformer. The manufacturer of the drive unit shall indicate this feature, together with supporting design and test data. The drive shall limit contributed line-side total harmonic distortion to 5% and single harmonic distortion to 3% of the fundamental 60 Hz voltage wave form.

B. Submit for information four (4) neatly bound copies of all operation and maintenance manuals for the variable frequency drive. Include drawings on each functional component, schematic and connection diagrams, listings of maintenance tasks and recommended schedules.

C. All VFD's required by this contract, whether for field installation or provided affixed to mechanical equipment (IE: Pumps, AHU's, RTU's, ETC) shall be of the same manufacturer. And shall comply with this specification.

D. Drive shall be as manufactured by Reliance, ABB, IDM Controls, Inc., Cutler Hammer, Square "D", General Electric.

PART 2 - PRODUCTS

2.1 GENERAL

A. The VFD and all its components shall be housed in a common NEMA / UL rated enclosure.

B. The VFDs shall be surface mounted in a Rated NEMA / UL enclosure; refer to plans & specification for installation condition: provide NEMA-12 enclosure (UL listed as a plenum rated) when installed within the building, provide NEMA-3R enclosure when installed in wet locations or outdoors exposed to the elements (include heaters and/or additional fans as needed).

C. VFD shall vary the speed of a three-phase, 60 Hz AC induction motor which proportionally varies the speed of the equipment.

D. VFD Input Power - The VFD input power terminals shall accept the required voltage (□10%) 3-phase, 3-wire, @ 60 Hz (□5%). A main circuit breaker shall be provided to serve as a means of disconnection and over current protection.

E. Door interlocked - padlockable circuit breaker disconnect that will disconnect all input power to drive and all internally mounted equipment

F. EMI / RFI filters. All VFDs shall include EMI/RFI filters. The VFD shall comply with standard EN 61800-3 for the First Environment, restricted level with up to 100' of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.

G. VFD Output Power - The VFD output power shall vary frequency to the motor from 0-500Hz with output voltage variation from zero to motor rated voltage for optimum volts per hertz (V/Hz) ratio. The output frequency of the drive shall be fully adjustable, however, from 0 to 66 Hz max. Output current shall be rated at 110% continuous output current rating for 1 minute every 10 minutes and 135% peak overload capacity for 2 seconds every 1 minute based upon the VFD's variable torque full load amps. The output must be a voltage source type generating a sine coded PWM waveform utilizing an asynchronous carrier frequency (output transistor switching frequency is to be independent of drive output frequency) up to 12,000 Hz. This carrier frequency shall be adjustable to minimize harmonically induced noise or vibration. This must be accomplished using a microprocessor based technique which forms a true sine coded current waveform to the motor for smooth performance at all speeds.

H. The VFD shall be suitable for the application required, and be capable of supplying required starting, breakaway, and operating torques within the operating speed ranges.

I. Overload relays shall be provided with the drive downstream of the drive and bypass contactors. Relays shall be set per NEC requirements to provide motor overload protection.

J. Line reactors shall be provided interconnected to the input of the Variable Frequency Drive to reduce input terminals with minimum 5% impedance.

K. VFD Power Structure - The VFD power structure which converts the input AC power to variable frequency output power shall consist of three functional stages:

1. Input Stage - The VFD power input sage shall convert three-phase AC line power to a fixed DC bus voltage. This will be accomplished with a solid state three-phase full wave diode rectifier with metal oxide varistor (MOV) three-phase protection. Displacement power factor shall be .98 throughout the speed range.

2. Intermediate Stage - The VFD intermediate power sage shall be interfaced with the VFD power component protection. The DC bus shall be fused for short circuit power protection. The DC bus shall have capacitive filtering to provide smooth DC power to the output power stage.

3. Output Stage - The VFD output stage shall utilize switching transistors to convert DC bus power to sine-coded PWM voltage source power for motor control. Current transformers (CTs) Shall be utilized to detect the output current of all three phases to the motor. This three-phase current detection shall be utilized by the microprocessor to generate information for:

   a. Three-phase current limit

   b. Ground fault and short circuit protection set per NEC.

   c. Speed search that allows drive to start into a rotating motor.

4. Insulated Gate Bipolar Transistors (IGBTs) shall be utilized in the inverter output section, enable the carrier frequency of 12KHz, with performance results of:

    a. Reduction of induced audible motor noise includes ability to enabled random variation to the switching frequency from 1KHz to 12KHz. This distributes the acoustic noise over a range of frequencies to lower the peak noise level.

    b. Maximum torque per amp performance of motor such that start at minimum output frequency of 1.5 Hz will produce 100% full load motor torque without use of extreme levels of voltage boost.

    c. Reduced motor heat rise above ambient, thereby reducing stress on motor insulation and mechanical components and thus increasing motor life.

2.2 OPERATION/PROTECTIVE FUNCTIONS

A. In order to avoid mechanical resonant vibrations drive shall have a programmable prohibited frequency range with an adjustable span of 0 to 10 Hz.

B. Detection of auto speed reference loss whereby the drive automatically drops to a preset speed upon loss of auto speed command signal.

C. Auto restart shall be programmable for up to ten attempts and is fault selective.

D. Power loss ride through of 2 seconds duration.

E. A programmed reverse run inhibit shall be provided to prevent reverse rotation of motor.

F. A control shall be provided to increase or decrease the output frequency and to hold it at a fixed desired frequency.

2.3 VFD CONTROL TERMINAL FUNCTIONS

A. The VFD shall include a control terminal strip for the purpose of accepting external control commands. These shall include:

1. For forward Run/Stop - A command from any normally-open contact shall cause the VFD to run.

2. Speed Reference Input - Shall be selectable to accept an instrument follower signal of:

    a. 1 to 5 VDC.

    b. 4 to 20mA current.

B. Multi-function output contacts shall be provided: one shall be a relay contact rated for 1 A at 230 VAC or 30VDC two shall be open collector outputs rated for 48VDC at 50mA. All shall be individually programmable for any of the following indications:

1. Run mode.

2. Zero speed detect.

3. Overtorque detect.

4. Coast to stop detect.

5. Run reference mode.

6. Speed reference mode.
7. Speed synchronization.
8. Output frequency detect
9. Low voltage detect
10. Operation ready.
11. Speed reference missing.
12. Braking resistor fault.
13. Drive fault.
14. Firestat/freezestat.

C. Output Fault Relay Contact - A form C fault relay contact shall be provided for remote indication that the VFD diagnostic has detected a fault condition and can be selectively activated when either a fault initially occurs or after final (unsuccessful) auto restart attempt. This contact shall be rated for lA at 230 VAC or 30 VDC.

D. Multi-function input terminals that will accept any external fault signal that will then shut down the drive and give a digital readout.

E. A multi-function analog output signal shall be provided, selectable for 1 to 5 VDC or 4 - 20 mA signal proportional to either output frequency or output current.

F. Serial Communications - The VFD shall have an EIA-485 port as standard. Standard protocols shall be ModBus,Johnson Controls N2, Siemens Building Technologies FLN, and BACnet MS/TP. Communications with both VFD and bypass capable of being monitored and/or controlled via serial communication.

2.4 LOCAL OPERATOR CONTROL

A. The VFD shall have a front mounted sealed touch-pad operator to include:

1. Local run/stop keys.
2. Local speed command.
3. Reset push-button.
4. Digital output frequency meter and speed reference meter which both can be programmed for other speed related indications, including RPM, CFM, FPM, etc.
5. Digital voltmeter.
6. Digital kilowatt meter.
7. Digital ammeter.
8. Ability to program various control functions without necessity of stopping drive while in run mode, including but not limited to the following:
    a. Acceleration and deceleration.
    b. Frequency command bias and gain.

c. Torque compensation.

d. Slip compensation.

e. Energy savings gain.

f. Multi-step speed references.

9. Digital diagnostic indication and protection for:

a. DC bus under voltage.

b. DC bus over voltage.

c. Load over torque.

d. Fuse blown.

e. Motor overload.

f. VFD overload.

g. Heatsink over temperature.

h. Instantaneous over current.

i. Operator error.

j. Central processor fault.

k. External fault.

l. Dynamic braking fault.

B. Hand-Off-Auto Switch and Speed Adjustment

1. Drive shall be provided with a HAND-OFF-AUTO or LOCAL-REMOTE switch and a display-mounted, manual speed adjustment. When the switch is in the HAND mode, the speed of the drive shall be controlled by the manual speed adjustment. When the switch is in the AUTO (REMOTE) mode, the speed of the drive shall be controlled by an external 1-5VDC or 4-20mA speed reference signal. See 2.03.A.2.

2.5 VFD ADJUSTMENTS

A. The microprocessor controlled VFD logic shall include the following adjustments:

1. Maximum output frequency - 0 to 66 Hz.

2. Minimum output frequency - 0 to 66 Hz.

3. Acceleration time - .1 to 60 seconds, minimum.

4. Deceleration time - .1 to 60 seconds, minimum.

5. Current limit - Adjustable 0 to 170%.

6. 15 V/Hz preset selection patterns.

7. Auto speed reference (instrument follower) input adjustable for bias and gain.

8. Stall prevention accomplished by reducing output voltage and frequency during momentary overload. When overload clears, drive shall automatically resume normal operation.

9. Adjustable torque and/or current limit.
10. Ramp to stop or coast to stop selection.
11. Capability to set upper and lower frequency limits independent of minimum and maximum V/Hz frequency patterns.
12. Selectable linear or S curve function for soft start.
13. Two independent selectable accel/decel ramp functions.
14. A minimum of 4 programmable multi-function inputs.
15. There shall be a programmable lock-out code available to prevent operator access to parameter setting.
16. A selectable/adjustable energy saving gain shall be available that can be activated during frequency command synchronization.
17. Minimum of 9 adjustable preset speeds.
18. Up/down frequency setting.
19. Drive adjustments and programming capable of being stored on a nonvolatile memory (EE-PROM).
20. Real time digital clock including time delay function.
21. Firemen's override input. Feature will override all command inputs.

2.6 VFD FUNCTIONAL SUMMARY

A. The VFD shall provide the following standard functions:

1. Ground fault protection.
2. Transducer (or process) follower.
3. Critical frequency rejection.
4. Diagnostics.
5. Selectable auto or non-auto restart.
6. Speed search.
7. DC injection.
8. Digital key pad display.
9. Minimum displacement power factor of .98.
10. Minimum efficiency of .97.
11. 2 second power loss ride-thru.
12. Upper and lower frequency limits.
13. Speed reference loss detection.
14. 9 preset speeds.

15. Stall prevention.

16. Run Permissive damper control.

2.7 QUALITY REQUIREMENTS

A. All printed circuit boards will utilize surface mounted devices (SMDs) to provide high reliability and strengthened printed circuit assembly:

1. Printed circuit boards burned in for 96 hours.

2. Integrated circuit boards tested to a criteria of 0.5% AQL (Accepted Quality Level).

3. Fully assembled VFD tested with fully loaded induction motors.

4. Mean Time between failures (M.T.B.F.) data should be available and have a minimum value of 100,000 hours.

B. Standards:

1. UL listed.

2. CSA certified.

3. Applicable items per NEMA, IEEE & IEC.

2.8 FACTORY TESTING AND INSPECTION

A. Inspect/test an incoming material for conformance to quality assurance specifications.

B. Fully test power semiconductors for proper electrical characteristics (dv/dt, di, dt, etc.).

C. Functionally test all chips (CMOS, TTL, LINEAR, etc.).

D. Inspect and test all subassemblies for conformance to drive manufacturer's engineering and quality assurance specifications.

E. Dynamically test all control printed circuit boards for a minimum of 24 hours while heat cycled 1 hour at each temperature setting from 32°F (0°C) to 140°F (60°C) and back to 32°F (0°C).

F. Run all inverter section(s) for a minimum of 4 hours, cycling motor to simulate full load and exercise Drive at all frequencies.

G. All drives shall be burned-in for a minimum of 48 hours cycling load to simulate no load/full load and exercise drive power requirements.

H. Furnish actual test data for the above items along with the drive.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Control Wiring: Other than internal to the VFD, control wiring shall be provided by this Contract.

3.2 ACCEPTANCE TESTING AND STARTUP

A. The supplier of the variable frequency drive shall provide a factory authorized representative to conduct startup and testing of the drive following installation. Testing shall be witnessed by the Engineer or Owner's Representative and shall verify, as a minimum, the proper operation of the following:

1. Drive output voltage/frequency at different speeds and drive loads. Input and output distortion shall be measured and shall be below those levels specified in Section 2.09.

2. Manual and automatic operations/controls. Simulate 4-20mA signals, if actual signals not available.

3. Displays and metering.

B. The drive factory representative shall also:

1. Perform, and duly record, a complete drive unit calibration.

2. Train Owner's personnel in proper operation and maintenance of the unit.

3. Verify that installed location of unit provides for adequate ventilation.

C. Submit all test results in triplicate to the Owner's Representative.

3.3 WARRANTY

A. Warranty shall be 24 months from the date of certified start-up. The warranty shall include all parts, labor, travel time and expenses.

END OF SECTION 230514

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230523

VALVES

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 RELATED WORK SPECIFIED ELSEWHERE

A. HVAC Piping: Section 232000

B. Pumps: Section 232123

C. Pipe and Valve Identification: Section 230553

D. Direct Digital Control for HVAC: Section 230923

E. Cleaning and Testing: Section 230593

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Valve Schedule: Valve schedule listing type of valve, manufacturer's model number and size for each service application.

D. Maintenance data for valves to include in the operation and maintenance manual specified in Division 1. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Valves and pressure relief devices shall conform to the specifications, regulations and requirements of all Agencies (Federal, State and Local), Codes, Local Gas and Power Companies and Associations having jurisdiction governing construction, sizing, application and location of same.

B. Single-Source Responsibility: Comply with the requirements specified in Division 1 Section "Materials and Equipment," under "Source Limitations" Paragraph.

C. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

D. MSS Compliance: Comply with the various MSS Standard Practice Documents referenced.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, and weld ends.

3. Set globe and gate valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure to 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 indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use hand wheels and stems as rigging points.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Valve Standardization: Valves supplied for each specific valve type shall be the product of one manufacturer. Valves from one or more manufacturers may be used.

B. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating. Valve parts of same manufacturer, size and type shall be interchangeable. All manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified. All valves, which use packing, shall be capable of being packed when wide open and under full working pressure. Size valves the same size as the piping in which they are installed, unless specified otherwise.

C. Furnish valves with chain operators when installed more than 8'-0" above grade or finished floor.

2.2 BALL VALVES

Conbraco Industries, Inc.; Apollo Division.
NIBCO Inc.
Stockham Valves & Fittings, Inc.
Watts Regulator Company.

A. Type BV: 300 psig OWG, cold, non-shock and a minimum working water pressure of 200 psig at 250 degrees F., with screwed or soldered ends, as required by the particular application. Furnish two piece bronze body valve with full port bronze ball, balancing stop, "Teflon" seats, "Teflon" or "Viton" stuffing box washers and gland seals, blow-out proof brass stem and corrosion resistant steel manual operating handle with a cool gripping cover. Provide extended stem valve handles on all valves.

2.3 GATE VALVES

Hammond Valve Corporation.
Milwaukee Valve Company, Inc.
NIBCO Inc.
Stockham Valve & Fittings, Inc.

A. Type A: MSS SP-80; Class 125, 200-psig OWG, cold working pressure (CWP); ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, Teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel

B. Type B: MSS SP-80; Class 150, 300-psig OWG, cold working pressure (CWP); ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded end connections; and with aluminum or malleable-iron handwheel.

C. Type C: MSS SP-70, Class 125, 200-psig OWG (150 psig OWG for 14" and larger), cold working pressure (CWP); ASTM A 126 class-B cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke IBBM OS & Y, teflon-impregnated packing with 2-piece packing gland assembly, flanged and screwed end connections; and with cast-iron handwheel.

2.4 CHECK VALVES

Hammond Valve Corporation.
Milwaukee Valve Company, Inc.
NIBCO Inc.
Stockham Valves & Fittings, Inc

A. Type A: 125 psig WSP, 200 psig OWG, 350 psig shell hydrostatic tests, horizontal swing, bronze body, brass or bronze trim, regrindable and renewable disc. Disc shall be rubber faced for cold water service and TFE for steam and steam condensate. Screwed ends.

B. Type B: 125 psig WSP, 200 psig OWG, 300 psig shell hydrostatic tests, horizontal swing, bronze body, brass or bronze trim, regrindable and renewable disc with solder ends. Disc shall be rubber faced for cold water service.

C. Type C: IBBM, 125 psig WSP, 200 psig OWG, 350 psig shell hydrostatic tests, bolted cover of iron or brass, regrindable and renewable seat ring and disc. Disc may be cast iron with bronze face on 4" and larger.

D. Type D: IBBM globe silent check, 175 psig OWG, 250 psig shell hydrostatic test, horizontal swing, spring loaded with 18-8 stainless steel spring. For inlet pressure in excess of 125 psig, shall be built for 400 psig OWG, 500 psig shell hydrostatic tests.

E. Type E: IBBM flangeless split clapper plate type, with integral body seat ring and plain or flat face end connections. A resilient Buna N seal shall be vulcanized to the body seat ring. Clapper plates shall be aluminum bronze; clapper springs and hinge pins shall be AISI Type 316 stainless steel and stop pieces of nickel plated steel.

2.5 GLOBE AND ANGLE VALVES

Hammond Valve Corporation.
Milwaukee Valve Company, Inc.
NIBCO Inc.
Stockham Valves & Fittings, Inc

A. Type A: 150 psig WSP, 300 psig OWG, 400 psig hydrostatic tests, bronze body, 500 Brinnel hardness stainless steel plug and 500 Brinnel hardness stainless steel replaceable seat ring, threaded ends.

B. Type B: IBBM, OS&Y, 125 psig WPS, 200 OWG psig non-shock, 200 psig seat and 300 psig shell hydrostatic tests for valves up to 12". Screwed or flanged ends depending on size.

C. Type C: 200 psig OWG, 300 psig hydrostatic tests, bronze body, solder ends, non-rising or rising stem.

2.6 LUBRICATED PLUG VALVES

Hammond Valve Corporation.
Milwaukee Valve Company, Inc.
NIBCO Inc.
Stockham Valve & Fittings, Inc.

A. Type AB: 125 psig OWG with screwed ends. Valve shall have cast iron body, brass plug with a phosphor bronze spring washer and a lubrication system. A valve wrench shall be furnished for each valve type or size.

2.7 BALANCING VALVES

Taco Inc.
Armstrong Pumps, Inc.
Bell & Gossett Div., ITT Fluid Technology Corp.

A. Calibrated Balancing Valve shall be of heavy brass, Ametal copper-alloy, or ductile iron construction, with visible graduated dial indicator built for a working water pressure of 200 psig at 250 degrees F., of straightway pattern. Valves shall have ports for reading pressure drop and charts calibrated to indicate corresponding flows. Adjustment shall be made by means of wheel handle with full turn opening.

2.8 DRAIN VALVES

Conbraco Industries, Inc.; Apollo Division mdl 78-200
NIBCO Inc. T-585-70-HC
Watts Regulator Company B-6000-CC

A. Ball Drain Valves: MSS SP-110, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port valves; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:

1. Operator: Vinyl-covered steel lever handle.

2. Stem Extension: For valves installed in insulated piping.

3. Hose thread connection and brass cap with chain.

2.9 SAFETY AND RELIEF VALVES

A. General Requirements: Safety valves, relief valves and safety relief valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Unfired Pressure Valves, etc., shall be tested, rated and listed, unless otherwise specified. Safety valves, relief and safety relief valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:

1. Valves for Unfired Pressure Vessels: Safety and safety relief valves on secondary side of unfired pressure tanks, water heaters and heat exchangers shall comply with Code, requirements governing applicable equipment as outlined, in ASME Code, Section IV, Article 4, Paragraph HG 400.3 and as follows: Secondary side of heat exchanger shall be protected by officially rated valves, set for same pressure or temperature as heretofore specified, when secondary side furnishes steam or hot water for purpose equivalent to purposes for which a boiler would be installed; valves for this purpose shall be sized in accordance with Unfired Vessel Code.

2. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4" to 3" IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3" IPS must be furnished with 125 lb. or 250 lb. flanged inlet and may be equipped with female threaded or 125 lb. flanged outlet.

2.10 NEEDLE STOP VALVES

Marsh Instrument Co.
H.O. Trerice Co.
Weksler Instruments Co.

A. For Temperatures to 300 degrees F.: All brass or forged carbon steel construction, union bonnet, screwed ends, built for 1000 psi at 300 degrees F.

2.11 GAGE COCKS

Marsh Instrument Company
Mueller Instruments Co.
H.O. Trerice Co.
Weksler Instruments Co.

A. Gage Cocks: All brass construction, "T" or lever handles, screwed ends, built for 300 psig hydraulic pressure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until satisfactory conditions have been corrected.

B. 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.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage

F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions, flanges or grooved joint couplings at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Furnish valves with chain operators when installed more than 8'-0" above grade or finished floor. Extend chains to 60" above grade or finished floor.

H. Discharge pipes on safety relief valves: If a safety relief valve is provided with a discharge pipe, the area of the discharge pipe shall not be less than the area of the valve. If multiple safety relief valves are piped together the area of the combined pipe must be greater than or equal to the sum of the areas of the valves/piping with which it connects.

I. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

2. Wafer Check Valves: Horizontal or vertical position, between flanges.

3.3 SOLDERED CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open gate and globe valves to fully open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.

D. Assemble joints, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.5 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.6 ADJUSTING

A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

3.7 VALVE APPLICATION SCHEDULE

A. Written continuity for specifying valves, using abbreviations and types, as employed under this Article, is as follows: Service of piping, symbol of service, pressure rating psig, size of valves, pipe end connection or valve end type, type of valve (gate or butterfly, globe or angle, check) in the aforementioned order unless otherwise specified.

B. General Application: Gate, ball, and butterfly valves for shutoff duty. Globe, ball and butterfly valves for throttling duty.

C. Schedule of valve applications for the different services is as follows:

1. Condenser Water - 125 psig and Less:

a. 3" and Less: BV ball Valves and A or B checks. Screwed or solder ends

2. Chemical Feed - 125 psig and Less: BV Ball Valves and A or B checks. Screwed or soldered ends.

3.8 CALIBRATED BALANCING VALVE APPLICATION SCHEDULE

A. Valves at full open shall have a pressure drop of approximately 5 ft. wg

B. Schedule of valve sizes and flows to be used is as follows:

Size (in.)	Nominal Flow (gpm)	Max* Flow (gpm)
1/2	0.5 - 2.8	4.5
3/4	2.8 - 6	10
1	6 - 10	15
1-1/4	10 - 15	25
1-1/2	15 - 20	34
2	20 - 36	60

*Maximum flow is calculated for the valve fully open and ♠P approximately 5 ft. wg (speed of water max 8.5 ft/sec)

C. Valve chart is based on Tour and Anderson, Model STAD/STAT and STAF.STAG. Verify valve size with manufacturer for specific application.

END OF SECTION 230523

SECTION 230529

PIPE HANGERS AND SUPPORTS

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 RELATED WORK SPECIFIED ELSEWHERE

A. Piping and Equipment Insulation: Section 230719

1.3 SUBMITTALS

A. Shop Drawings:

1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.

2. Details of pipe anchors.

B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

1.4 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
UP to 2-1/2	4	16	6	10
3 to 6	4	14	6	10
8 to 14	10	12	12	16
16 and up	10	10	12	16

B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE
Up to 2-1/2	8	18
3 to 8	10	16
10 to 14	12	12
16 and up	18	10

C. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping 10 inches ips and larger.

1. Swivel ring type hangers will be allowed for sprinkler piping up to a maximum of 2 inches in size.

D. Adjustable Floor Rests and Base Flanges: Steel

E. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two nuts at each end for positioning rod and hanger, and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, 2-1/2 to 20 inches, from single rod if horizontal movement caused by expansion and contraction might occur.

H. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, 2 to 30 inches, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction

I. Restraints, Anchors, and Supports for Grooved End Piping Systems: As recommended by the grooved end fitting manufacturer.

J. Foam Insulated Pipe Hanger: Single-piece thermally insulated pipe hanger with self-adhesive closure. CFC-free PET load-bearing segments embedded in closed cell insulation with outer shell of 30-mil thick painted aluminum.

2.2 FASTENERS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN1405, HN-1614, FS-1411 Series. - ALSO AVAILABLE STAINLESS STEEL.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS-3822. - ALSO AVAILABLE GALVANIZED AND STAINLESS STEEL.

C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, or Red Head/Phillips Series S-14.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS-38 Series.

F. Continuous Slotted Type Concrete Insert, Galvanized:

1. Load Rating 800 lbs/ft: Kindorf's D-986.

2. Load Rating 1500 lbs/ft: Kindorf's D-980.

3. Load Rating 3000 lbs/ft: Hohmann & Barnard's Inc. Type CS-H.

4. Load Rating 4500 lbs/ft: Hohmann & Barnard's Inc. Type CS-HD.

G. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4 inch dia machine bolts.

H. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept 3/4 inch dia bolts having special wedge shaped heads.

I. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.3 SHOP PAINTING AND PLATING

A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with zinc chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper pipe or copper tubing.

B. Hanger supports for chromium plated pipe shall be chromium plated brass.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Place inserts into construction form work expeditiously, so as not to delay the Work.

3.2 INSTALLATION

A. Do not hang or support one pipe from another or from ductwork.

B. Support all insulated horizontal piping by means of hangers or supports with insulation shields installed outside of the insulation.

C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.

1. For Steel and Alloy Steel:

Pipe Size (Inches)	Maximum Spacing (Feet)
1 and under	8
1-1/4 and 1-1/2	9
2	10
2-1/2 and over	12

2. For Copper Pipe and Copper Tubing:

PIPE OR TUBING SIZE (Inches)	MAXIMUM SPACING (Feet)
3/4 and under	5
1-1/4	6
1-1/2 and 2	8
2-1/2	9
3 and over	10

3. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

4. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

5. For Branch Piping Runs and Runouts over 5 Feet in Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.

6. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

D. Size hanger rods in accordance with the following:

PIPE OR TUBING SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	Pipe	Tubing	Pipe	Tubing
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	½	3/8	3/8	1/4

1. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each rod, two at upper hanger attachment and two at hanger.

3.3 UPPER HANGER ATTACHMENTS

A. General:

1. Do not use drive-on beam clamps.

2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.

3. Do not drill holes in main structural steel members.

4. "C" clamp type of upper hanger attachments with restraining straps may be used as upper hanger attachments for the support of piping up to a maximum of 3 inches in size and a temperature from 50 degrees F to 200 degrees F.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.

2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.

3. Do not drill holes in main structural steel members.

4. "C" clamp type of upper hanger attachments with restraining straps may be used as upper hanger attachments for the support of piping up to a maximum of 3 inches in size and a temperature from 50 degrees F to 200 degrees F.

C. Attachment to Concrete Filled Steel Decks (Total thickness, 2-1/2 inches or more): Where necessary, attach hangers to the deck with welding studs (except at roof decks), thru-bolts with fish plates or tee hangers. Do not support a load, in excess of 250 lbs from any single welded stud, and thru-bolts with fish plates or tee hangers shall not be used to support piping over 2 ½" inches in size.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner which will not affect the structural integrity of the building.

3.5 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold and hot service insulated piping. Direct hanger contact of pipe for hot or cold piping is not allowed. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.6 PIPE SUPPORT FOR SYSTEMS INSULATED WITH FLEXIBLE ELASTOMERIC FOAM

A. Install a single-piece thermally insulated pipe hanger with self-adhesive closure at all points of support for piping or tubing to be insulated for cold and hot service insulated piping. Direct hanger or clamp contact of pipe for hot or cold piping is not allowed.

3.7 PIPE INSULATION SHIELDS

A. Install a pipe insulation shield (unless provided with a combination clevis hanger as described above) at all points of support, for cold and hot service insulated piping. Direct hanger contact of pipe for hot or cold piping is not allowed. Center shields on all hangers and supports, and install in such a manner so as not to cut, puncture or compress insulation.

END OF SECTION 230140

SECTION 230548

SEISMIC RESTRAINTS

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 seismic restraints and snubbers for mechanical and electrical components. It complements optional seismic construction requirements in the various component sections.

B. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.

C. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.

D. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent Building Code of New York State, national or local construction requirements (i.e. California Title 24, California OSHPD or other requirements).

E. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an acceptable manner.

F. Seismic restraints shall be designed in accordance with seismic force levels as detailed in section 1.07.

1.3 THE WORK IN THIS SECTION INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

A. Seismic restraints for isolated equipment.

B. Seismic restraints for non-isolated equipment.

C. Certification of seismic restraint designs and installation supervision.

D. Certification of seismic attachment of housekeeping pads.

E. All mechanical and electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included. Equipment referred to below is typical. (Equipment not listed is still included in this specification).

AC Units Fans (All types) Tanks (All types) Heat Pumps
Energy Recovery Ventilators Comp. Room Units Unit Heaters
Air Separators Condensers Motor Controls Var. Freq. Drives
Conduit Piping Pumps (All types) Cabinet Heaters
Ductwork VAV boxes

1.4 RELATED WORK

A. Housekeeping Pads

1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.

2. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.

B. Supplementary Support Steel: Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.

C. Attachments: Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps etc. as required.

1.5 SUBMITTALS

A. Professional Engineer Qualification Statement: The professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of the kind indicated. Letter to be signed and sealed by a professional engineer. (Submittal shall be rejected without qualification statement).

B. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finishes for each type of isolator and restraint. Include load deflection curves.

1. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable by authorities having jurisdiction.

C. Shop Drawings: Indicate materials, and show designs and calculations, signed and sealed by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, and selection of seismic restraints and anchors. Include calculations of combined tensile and shear loads.

2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.

3. Seismic Restraint Details: Detail fabrication and attachment of restraints and snubbers for all systems including but not limited to equipment, piping, ductwork, diffusers.

4. Preapproval and Evaluation Documentation: By an agency acceptable by authority having jurisdiction, showing maximum ratings of restraints and the basis for approval (tests or calculations).

5. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for all components with other systems and equipment, including seismic restraints, in the vicinity. Coordinate seismic restraints with vibration isolation and expansion compensation systems.

6. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.

   a. Qualification Data: For firms and persons specified in a Quality Assurance@ Article.

   b. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

1.6 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in accordance with State of New York Building Code and Local Codes and Ordinances and the Authority having jurisdiction.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

1.7 PROJECT CONDITIONS

A. This project is subject to the seismic bracing requirements of the 2020 Building Code of New York State. The following criteria are applicable to this project.

1. Seismic Design Category (Table 1616.3(1)): **C**

2. Seismic Risk Category (Table 1604.5): **IV**

3. Site Class Category (Table 1613.2.2): **D**

4. Design Spectral Response Acceleration (S_{DS}, Section 1615.1.3): 0.198

   a. Site Coefficient (F_a, Table 1615.1.2(1)): 1.6

   b. Mapped Spectral Acceleration (S_S, Section 1615.1): **.186**

5. Seismic Importance Factor (I_P, Section 1621.1.6): **1.5**

6. Component Amplification Factor (a_P, Table 1621.3): Per ASCE 7-16

7. Component Response Mod. Factor (R_P, Table 1621.3): **3.0**

8. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Forces shall be calculated for the above requirements and Equation 16-67, 68, & 69 in section 1621.1.4, unless exempted by 1621.1.1.

1.8 COORDINATION

A. Coordinate layout and installation of vibration isolation and seismic-restraint devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete housekeeping and vibration isolation bases. Cast anchor-bolt inserts into base.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate design of restraints and vibration isolation design with expansion compensation systems.

E. Coordinate and design all attachments with building structural system.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver strut systems, pipe hangers and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.

B. Store strut systems, pipe hangers and components in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install seismic-control products according to manufacturer's written instructions and authorities having jurisdiction.

B. Anchor interior mounts, isolators, hangers, and snubbers to vibration isolation bases. Bolt isolator base plates to structural floors as required by authorities having jurisdiction.

C. Install pipe connectors at connections for equipment supported on vibration isolators.

D. Installation of seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

E. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

F. The contractor shall not install any equipment, piping, duct, or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs, and walls.

G. Coordinate work with other trades to avoid rigid contact with the building.

H. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineer's attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors' expense.

I. Bring to the architects/engineer's attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors' expense.

J. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor's expense.

K. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:

1. Flanges of structural beams.
2. Upper truss cords in bar joist construction.
3. Cast in place inserts or wedge type drill-in concrete anchors.

L. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

M. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

N. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.

O. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.

P. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.

Q. Where piping passes through walls, floors, or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.

R. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28 (see selection guide).

3.2 SEISMIC RESTRAINT OF PIPING

A. Seismic Restraint of Piping

1. Seismically restrain all piping listed as a, b, or c below. Use specification 12 cables if isolated. Specification 12 or 13 restraints may be used on unisolated piping.
   a. Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1" (25mm) I.D. or larger.
   b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.
   c. All other piping 2 1/2" (64mm) diameter and larger.
2. Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

3. Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided, they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.

5. For fuel oil and all gas piping transverse restraints must be at 20' (6m) maximum and longitudinal restraints at 40' (12m) maximum spacing.

6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" (600m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.

7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner like clevis supports.

8. Branch lines may not be used to restrain main lines.

9. Cast iron pipe of all types, glass pipe and any other pipes joined with a four-band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.02.C.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.02.C.2 and 3.

B. Seismic restraint of ductwork

1. Seismically restrain all ductwork with specification 12 or 13 restraints as listed below:

   a. Restrain rectangular ducts with cross sectional area of 6 sq.ft. (.5 m^2) or larger.

   b. Restrain round ducts with diameters of 28" (700mm) or larger.

   c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.

   d. Restrain ductwork containing hazardous exhaust or hazardous gases. To include Generator exhaust, Chemical fumes etc.

2. Transverse restraints shall occur at 30' (9mm) intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.

3. Longitudinal restraints shall occur at 60' (18m) intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.

4. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.

5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.

6. Walls, including gypsum board non-bearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

C. All mechanical equipment shall be seismically restrained.

3.3 SEISMIC RESTRAINT EXCLUSIONS

A. Piping

1. Gas piping less than 1" (25mm) inside diameter.
2. Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.
3. All other piping less than 2 1/2" (64mm) inside diameter.
4. All piping suspended by individual hangers 12" (300mm) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.
5. The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

B. Ductwork

1. Rectangular and square and ducts that are less than 6 square feet in cross sectional area.
2. Oval ducts that are less than 6 square feet (.5m^2) in cross sectional area based on nominal size.
3. Round duct less than 28" (.5m^2) in diameter.
4. All duct suspended by hangers 12" (300mm) or less in length as measured from the top of the duct to the point of attachment to the structure. Hangers must be attached within 2" (50mm) of the top of the duct with a minimum of two #10 sheet metal screws. If the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.

C. Suspended Equipment

1. VAV boxes and fan powered equipment weighing less than 50 lbs. (23kg) and rigidly connected to the supply side of the duct system and supported with a minimum of 4 hanger rods.

3.4 SEISMIC CONTROL

A. Vibration Isolation Bases: Mount equipment on structural-steel bases or concrete inertia bases.

B. Snubbers: Install the required number of seismic snubbers on each spring-mounted piece of equipment. Locate snubbers as close as possible to the vibration isolators and bolt to supporting structure.

3.5 ADJUSTING AND CLEANING

A. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operations.

B. Adjust thrust restraints for a maximum of 1/4 inch of movement at start and stop.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in piping and ductwork where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at equipment anchored to a different mobile structural element from the one supporting them. The seismic engineer of record shall (through properly substantiated calculations) design the appropriate methods of accommodating the displacements. To accept the motion, which is usually determined from the structural engineer of record, systems can be designed by one of the following methods:

1. Design systems to have the inherent flexibility required to accept the differential motion using pipe loops and/or offsets.
2. Localize the area at which differential motion will occur by anchoring to each building and provide a set of flexible connectors arranged to accept the motion.
3. Flexible connectors shall be model Seismijoint as manufactured by Southeastern Hose, Inc., or equal.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Test pull-out resistance of seismic anchorage devices.

1. Provide necessary test equipment required for reliable testing.
2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been accepted), and with at least seven days' advance notice.
4. Obtain Architect's approval before transmitting test loads to the structure. Provide temporary load-spreading members.
5. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
6. Test to 90 percent of rated proof load of device.
7. If a device fails the test, modify all installations of same type and retest until satisfactory results are achieved.
8. Record test results.
9. Provide walk-through of project to verify installation in accordance with Specifications and Engineered Submittals. Submit approval letter signed and sealed from the seismic engineer of record shall for installation and completion.

END OF SECTION 230548

SECTION 230549

CONCRETE PADS FOR EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REFERENCES

A. Except where shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-84 of the American Concrete Institute.

1.3 STORAGE

A. Store materials as required to insure the preservation of their quality and fitness for the Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Anchor Bolts: Standard Bolts, ASTM A 307, with lock washers and nuts.

B. Steel Plates: ASTM A 36.

C. Sleeves: Steel Pipe, Schedule 40, black, ASTM A 53.

D. Steel Shims and Fillers: ASTM A 569.

E. Reinforcement: Furnish the following unless otherwise indicated on the Drawings:

1. Fabric Reinforcement: ASTM A 185 welded wire fabric, 6 x 6 - W2.9 x W2.9 fabricated into flat sheets unless otherwise indicated.

2. Bar Reinforcement: ASTM A 615, grade 60, deformed.

3. Metal Bar Supports: AISI Type 430 stainless steel or plastic.

4. Tie Wire: Black annealed wire, 16 gage minimum.

F. Bonding Agent (Adhesive): Epoxy-resin-base bonding system, Type II, complying with ASTM C 881. Grade and class as required by conditions of use.

G. Cement Grout: Portland cement and clean natural sand mixed at a ratio of 1.0 part cement to 3.0 parts sand, with only the minimum amount of water required for placement and hydration.

H. Dowels: #4 size rebar ASTM A 615 Grade 60 deformed, grouted solid with HILTI HY-200 adhesive system. Embed 2-¾" and install per manufactures specifications.

2.2 PROPORTIONING OF CONCRETE MIXES

A. Compressive Strength: Minimum 3000 psi.

B. Weight: Normal.

C. For outdoor installations: Concrete shall be air-entrained. Design air content shall be 6 percent by volume, with an allowable tolerance of ∀ 1.5 percent for total air content. Entrained air shall be provided by use of an acceptable air-entrained admixture. Air-entrained cement shall not use used.

D. Slump: Between 2 inches and 4 inches.

E. Admixtures: Do not use admixtures in concrete unless specified or acceptable in writing by the Engineer.

F. Selection of Proportions: Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches, unless otherwise acceptable in writing by the Engineer. Proportion mix with minimum cement content of 564 pounds per cubic yard for 3000 psi concrete.

2.3 FABRICATION OF ANCHOR BOLT ASSEMBLIES

A. Bolts: Diameter 1/8" less than the bolt holes in the equipment supports and length equal to the depth of the pad minus 1 inch plus the additional length required to provide full thread through nuts after shims, equipment and washers are in place.

B. Sleeves: Diameter ½" larger than the bolt diameter and length as required to extend from the head of the bolt to the top of the pad.

C. Plates: 3 x 3 x ¼" steel plate.

D. Weld a plate to the head end of a bolt. Center the bolt in a sleeve and tack weld the sleeve to the plate.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. For outdoor installations: Concrete materials, reinforcement and forms which will be in contact with fresh concrete shall be free from frost at the time of concrete placement.

B. Concrete pads shall be coordinated with equipment provided and shall be 6" high and 4" longer and wider than equipment supported.

3.2 BONDING TO EXISTING CONCRETE SLAB

A. Where more than one pad is required for a single piece of equipment, install 4 dowels in existing slab for each pad. Drill existing slab as required to install dowels 2-¾" inches into the existing concrete. Grout dowels in the drilled holes.

B. Prior to placing concrete, thoroughly clean the existing concrete slab. Allow existing concrete to dry and apply bonding agent (adhesive) over the existing concrete in accordance with manufacturers printed instructions.

3.3 INSTALLING ANCHOR BOLTS AND SLEEVES

A. Install anchor bolts (with sleeves) for all bolt holes in equipment supports.

B. Accurately position and securely support anchor bolts and sleeves prior to placing concrete. Support head of bolt one inch above bottom of pad. Temporarily close open end of sleeves to prevent entry of concrete.

C. Grout anchor bolts in sleeves with cement grout or acceptable shrink-resistant grout after final positioning.

3.4 REINFORCING

A. Except where other reinforcement is shown on the Drawings, install welded wire fabric at a depth of 2" in each pad, extending to within two inches from perimeter of pad.

3.5 FINISHES

A. Formed Surfaces: Provide a smooth form finish, with rounded or chamfered external corners, on all concrete surfaces exposed to view.

B. Unformed Surfaces: Provide a troweled finish on top surface of pads.

END OF SECTION 230549

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230553

PIPE AND VALVE IDENTIFICATION

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 RELATED WORK SPECIFIED ELSEWHERE

Duct and Equipment Identification: Section 230554

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each item specified.

1.4 REFERENCES

ANSI A13.1 - Scheme for Identification of Piping Systems

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

W.H. Brady Co., Milwaukee, WI.
Emed Co., Buffalo, NY.
Panduit Corp., Tinley Park, IL.
Seton Nameplate Corp., New Haven, CT.
Bunting Inc., Pittsburgh, PA.

2.2 PIPE MARKERS AND ACCESSORIES

A. Snap-on Marker: One piece wrap around type constructed of precoiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, 3/4 inch adhesive strip on inside edge, and 360 degree visibility.

B. Strap-On Marker: Strip type constructed of precoiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, factory applied grommets, and pair of stainless steel spring fasteners.

C. Stick-On Marker: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flow arrow banding tape is not being used.

D. Pipe Marker Legend and Color Field Sizes:

OD of Pipe or Insulation (Inches)	Letter Size (Inches)	Length of Color Field (Inches)
3/4 to 1-1/4 incl.	1/2	8
1-1/2 to 2 incl.	3/4	8
2-1/2 to 6 incl.	1-1/4	12
8 to 10 incl.	2-1/2	24
Over 10	3-1/2	32

E. Banding Tapes: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating.

1. Plain Tape: Unprinted type; color to match pipe marker background.

2. Flow Arrow Tape: Printed type with integral flow arrows; color to match pipe marker background.

F. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

2.3 PIPE SERVICE IDENTIFICATION TAGS

A. Type: No. 19 B & S gage brass, with 1/4 inch high pipe service abbreviated legend on one line, over 1/2 inch high pipe size legend in inches, both deep stamped and black filled; and 3/16 inch top hole for fastener.

B. Size: 2 inch square tag.

C. Fasteners: Brass "S" hook or brass jack chain of size as required for pipe to which tag is attached.

2.4 VALVE SERVICE IDENTIFICATION TAGS

A. Type: No. 19 B & S gage brass, with 1/4 inch high valve service abbreviated lettering on one line over 1/2 inch high valve service chart number, both deep stamped and black filled; and with 3/16 inch top hole for fastener.

B. Sizes: HVAC Use: 1-1/2 inch dia round.

C. Fasteners: Brass "S" hook or brass jack chain of size as required for valve stem or handle to which tag is attached.

2.5 VALVE SERVICE IDENTIFICATION CHART FRAMES

A. Type: Satin finished extruded aluminum frame with rigid clear plastic glazing, size to fit 8-1/2 x 11 inches valve chart.

PART 3 - EXECUTION

3.1 PREPARATION

A. Complete testing, insulation and finish painting Work prior to completing the Work of this Section.

B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.

3.2 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturers printed installation instructions, unless otherwise specified.

B. Stick-On Pipe Markers:

1. Install minimum of 2 markers at each specified location, 90 degrees apart on visible side of pipe.

2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.

C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of 2 pipe size labels at each specified locations, 90 degrees apart on visible side of pipe.

D. Pipe Service Identifications Tags: Attach tags to piping being identified with "S" hooks or jack chains.

3.3 PIPING IDENTIFICATION SCHEDULE

A. Piping Identification Types:

1. Piping or Insulation under 3/4 inch od: Pipe identification tags.

2. Piping or Insulation 3/4 inch to 5-7/8 inch od: Snap-on marker or stick-on marker.

3. Piping or Insulation 6 inch od and Larger: Strap-on marker or stick-on marker.

B. Identify all piping systems, installed within and exterior of the building, piping exposed to view, above all ceilings, bare and insulated, as to content, size of pipe and direction of flow, with the following exceptions:

1. Piping in furred wall spaces, except in valve access panels where valves and piping shall be identified as specified for exposed piping systems.

2. Piping exposed in finished spaces such as offices, classrooms, wards, toilet rooms, shower rooms and spaces as specified.

C. Locate piping identification (with in 24") at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs. Where two or more pipes run in a parallel, place the printed legend and other markers in the same relative location.

3.4 VALVE IDENTIFICATION SCHEDULE

A. Valve Service Identification Tags:

1. Tag service, balance, isolation and control valves installed under this project, with a brass tag fastened to the valve handle or stem, marked to indicate service and numbered in sequence for the following applications:

   a. Valves in heating, ventilating, air conditioning and refrigeration systems.

B. Valve Service Identification Charts:

1. Provide 2 framed valve charts for each piping system specified to be provided with valve identification tags. Type charts on 8-1/2 x 11 inches heavy white bond paper, indicating valve number, service and location.

2. Hang framed charts at locations as directed.

END OF SECTION 230553

SECTION 230554

DUCT AND EQUIPMENT IDENTIFICATION

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 RELATED WORK SPECIFIED ELSEWHERE

Pipe and Valve Identification: Section 230553
Painting: Section 099100

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each item specified

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver paint to the Site in original, new unopened containers, bearing manufacturers' printed labels.

B. Store materials at the site where directed. Keep storage space clean and accessible to the Engineer at all times.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint: Semi-gloss enamel (latex base) complying with the requirements of FS TT-P-001511.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not execute the Work of this Section until all testing, insulation and finish painting Work have been completed.

B. Place drop cloths or other suitable protection as required to avoid damage and paint spatters on adjacent surfaces.

3.2 DUCT IDENTIFICATION

A. Identify exposed ductwork, bare or insulated, directly connected to air handling apparatus, in the following spaces or rooms, by means of painted stenciled legends:

1. Mechanical Equipment Room
2. Steam Service
3. Refrigeration Machine
4. Boiler Room
5. Penthouse
6. Power House

B. Locate stenciled legends to be readily visible from any point of observation. Stencil identification along center line of duct, close to equipment. Where view is unobstructed from two directions, apply two sets of stenciling (both sides), visible from each direction.

C. Letter Size: 1-1/2 inches in height.

D. Samples of Ductwork Identification:

1. Outside Air (OA)
2. Supply Air (SA)
3. Return Air (RA)
4. Exhaust Air (EA)

E. Colors: Paint stenciled letters black. Where the background color is dark, paint background white before stenciling.

3.3 EQUIPMENT IDENTIFICATION

A. Identify mechanical equipment, bare or insulated, installed in the following spaces or rooms, by means of painted stenciled legends:

1. Mechanical Equipment Room
2. Steam Service
3. Refrigeration Machine
4. Boiler Room
5. Penthouse
6. Power House
7. Roof – Provide engraved aluminum nameplate
8. At Grade – Provide engraved aluminum nameplate

B. Paint stenciled legends black, a minimum of 1-1/2 inches (6 inches in Mechanical Equipment Rooms) in height, located to be readily visible from a reasonable point of view. Place identification along center line of equipment, if possible.

C. Engraved Plastic-Laminate Signs (Interior use where paint stencil is not appropriate.):

1. ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine subcore, except when other colors are indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

2. Engraved with engraver's standard letter style, of sizes and with terms to match equipment identification.

3. Thickness: 1/16 inch, for units up to 20 square inches or 8 inches length; 1/8 inch for larger units

4. Fasteners: Self-tapping stainless steel screws or aluminum pop rivet

D. Engraved Aluminum Nameplate:

1. Black surface, with white (letter color). Fabricate in sizes required for message. Provide two side holes for mechanical fastening.

2. Engraved with engraver's standard letter style, of sizes and with terms to match equipment identification.

3. Thickness: 0.020 inch.

4. Fasteners: Self-tapping stainless steel screws or aluminum pop rivet

E. Samples of Equipment Identification:

1. Air Conditioning Unit AC-1

2. Supply Fan S-1

3. Exhaust Fan E-1

4. Return Fan R-1

3.4 ACCESS DOOR IDENTIFICATION

A. Access doors adjacent to fire damper, smoke damper or smoke detector shall be identified with letters no less than 1/2" high in accordance with NYS IMC.

3.5 APPLICATION OF PAINT

A. Stencil Painting: Apply with a brush or aerosol type spray can.

3.6 CLEANING

A. Clean adjacent surfaces of paint spatters resulting from the Work of this Section.

END OF SECTION 230554

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230593

CLEANING AND TESTING

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 RELATED WORK SPECIFIED ELSEWHERE

Balancing of Systems: Section 230594

1.3 SUBMITTALS

A. Quality Control Submittals

1. Test Reports (Field Tests):

a. Refrigeration Systems: Submit results of Refrigeration Systems Pressure - Dehydration Tests.

b. Low Pressure Steam or Hot Water Heating Boilers: Submit results on Boiler Test.

c. Propylene Glycol System Test: Submit results on Propylene Glycol Systems.

B. 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.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.

2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.5 PROJECT CONDITIONS

A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gages for field testing of systems.

1.6 SEQUENCING AND SCHEDULING

A. Transmit written notification of proposed date and time of operational tests to the Owner's Representative at least 5 days in advance of such tests.

B. Perform cleaning and testing Work in the presence of the Owner's Representative.

C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems, or temporary valves or caps as required to perform the Work.

D. Duct Systems: Clean new and existing duct system(s) before testing, adjusting, and balancing.

PART 2 PRODUCTS

2.1 ATERIALS

A. Test Equipment and Instruments: Type and kind as required for the particular system under test.

B. Test Media (air, gas, refrigerant, vacuum, water): As specified for the particular piping or system under test.

C. Cleaning Agent (chemical solution, steam, water): As specified for the particular piping, apparatus or system being cleaned.

D. Propylene Glycol: Permanent type inhibited anti-freeze solution as manufactured by Dow Chemical Co. or Union Carbide. Dowfrost or Ucar Protherm respectively. Final system concentration to be 25% & 40% glycol. .

PART 3 EXECUTION

3.1 PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

B. Connections or extension of existing piped systems: Prior to connecting to any existing system(s), the Mechanical Contractor shall take sample of fluid and provide test reports of the existing fluids chemical, residuals and or glycol concentration to the Engineer for acceptance. If the test results have not been provided prior to connection, the Mechanical Contractor shall be held responsible in bringing the entire hydronic system within acceptable specifications. The Mechanical Contractor shall top off the new or existing glycol feed tank, at project closeout.

C. Thoroughly clean compressed air, control air, refrigerant pipe and similar systems prior to pressure or vacuum testing.

3.2 PRESSURE TESTS - PIPING

A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.

B. Water Systems:

1. Circulating water systems, including propylene glycol solution systems and cold water make-up piping connections to heating, ventilating, air conditioning and refrigeration systems, unless otherwise specified:

a. Before final connections are made perform hydrostatic test at 1-1/2 times the maximum working pressure, but not less than 125 psig, for 4 hours.

b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating system design pressure, but not less than 30 psig, for 4 hours.

2. High temperature water systems (supply and return):

a. Before final connections are made perform hydrostatic test at 450 psig for 4 hours.

b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating design pressure, but not less than 250 psig for 4 hours.

3.3 HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS - CLEANING AND OPERATIONAL TESTING

A. Circulating Water Systems:

1. Cleaning: Flush systems and apparatus, upon completion of pressure and miscellaneous tests. Completely open valves and flush each system with clean water, prior to chemical cleaning. Repeatedly flush at short intervals until twice the system water capacity has been flushed through. Chemically clean systems immediately following flushing operations. Circulate a solution consisting of Citri-Clean in dilution rates as indicated by manufacturer. Completely fill system with cleaning solution; vent system and place in operation, with automatic controls operating and valves fully open. Allow system to reach design operating temperature or an operating temperature designated by the Owner's Representative. Circulate the solution through the system for a minimum of 4 consecutive hours; immediately drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during cleaning operations. Remove and clean strainer screens prior to operational test. Refill system with clean water.

2. Operational Test: Run system in an automatic mode for a minimum of 120 consecutive hours. During this time, make final adjustments, including the setting of the balancing valves.

B. Propylene Glycol Systems:

1. Clean as specified for circulating water systems.

2. Drain system and refill with water/propylene glycol mix. Add water or glycol as needed to obtain required mixture level.

3. Perform operational test as specified for circulating water systems with propylene glycol solution in system.

3.4 DUCT SYSTEM AND EQUIPMENT CLEANING

A. Duct Systems:

1. Use service openings for entry and inspection.

   a. 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 "Ductwork Accessories" for access panels and doors.

   b. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.

   c. Remove and reinstall ceiling to gain access during the cleaning process.

2. Particulate Collection and Odor Control:

   a. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for O.3-micron-size (or larger) particles.

   b. 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.

B. 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.

C. 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. 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.

3.5 REFRIGERATION SYSTEMS - TESTING, DEHYDRATION AND CHARGING

A. Leak Test Procedure:

1. Refrigerant Piping Systems:

a. Pressurize with dry nitrogen to 50 psig and test for leaks using a bubble type solution.

b. Release this partial test pressure and correct deficiencies.

c. Charge system with a trace of refrigerant to 15 psig, then add dry nitrogen until system test pressures are reached and retest for leaks with an electronic leak detector.

d. Release pressure, repair leaks and retest as necessary until no leaks occur.

e. Recover refrigerant used for leak testing.

2. System Test Pressures:

a. Charge system with dry nitrogen and trace of refrigerant (HFC 134A, HFC 245, HFC 404, HFC 407C, HFC 410A or HFC 507) to 350 psig and retest for leaks with an electronic leak detector. The system must stay at 350 psig pressure for 24 hours to pass the system test pressure test.

b. Release pressure, repair leaks and retest as necessary until no leaks occur.

c. Recover refrigerant used for leak testing.

B. Dehydration:

1. Low and Ultra Low Temperature Refrigeration Systems (-30 degrees F to 32 degrees F:

a. Following pressure tests, dehydrate each system with a vacuum pump.

b. Draw and hold an initial vacuum of 800 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

d. Draw and hold a third vacuum of 250 microns for 8 to 12 hours with an allowable maximum rise of 50 microns. Break this third vacuum by adding liquid refrigerant specified for the equipment to the high side of the system (liquid line).

e. Verify vacuum obtained with an electronic vacuum gage.

2. Medium Temperature Refrigeration Systems (33 degrees F to 55degrees F), and Air Conditioning Systems:

a. Following pressure tests, dehydrate each system with a vacuum pump.

b. Draw and hold an initial vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

d. Verify vacuum obtained with an electronic vacuum gage.

C. Refrigerant Charging: Follow equipment manufacturer's printed charging directions unless otherwise specified.

1. Introduce refrigerant of type and quantity required through a filter/drier installed in the temporary charging line.
    a. Purge small amount of liquid out of the system side of the charging hose.
    b. Prevent moisture and other contaminants from entering the system.
2. Charge liquid refrigerant through a charging valve provided in the high pressure side of the system.
    a. Small amounts of gaseous refrigerant may be charged through the compressor suction service valve port.
3. No bubbles shall appear at the moisture-liquid indicator when the system is fully charged and operational. Do not overcharge.
4. Record the weight in pounds of refrigerant charged into each system and submit this record to the Director's Representative.

D. Compressor Oil Charge: Pump oil into the compressor after the last vacuum has been preformed. Follow all Manufactures Recommended for oil type and amount to be installed.

E. Adjustments and Operational Testing:

1. Adjustments: Place the system in operation with automatic controls functioning. Adjust controls and apparatus for proper operation. Test thermometers and gages for accuracy over the entire range. Remove and replace items found defective.
    a. Check belts, fan blades, fittings, TXV bulbs, and electrical connections for tightness before start up.
    b. Check TXV bulb for proper location should be between 8 and 10 o'clock or 2 & 4 o'clock.
    c. Seal off all holes in the condition space as specified.
    d. Provide a point to point control check of the system to ensure that the specified inputs and outputs are receiving the signal from the proper sensors or controlling the proper device.
    e. Set pressure controls and safety controls.
    f. Close or de-energize all solenoids, and start up the system.
    g. Check that all controls and safety switches are operating properly.
    h. Adjust TXV for proper super heat back to the compressors.
    i. Clean TXV strainers as many times as required.
    j. After one week of run time, change the liquid cores if they are the replaceable type.
    k. After one month of run time, replace the liquid cores and compressor suction socks. Replace the liquid cores as required. Clean the TXV's as required.

2. Operational Test:

   a. Place system in operation, with final connections to equipment and with automatic controls operating, and operate for a minimum of 120 consecutive hours.

   b. Operational test shall prove to the satisfaction of the Director's Representative that the system can produce the cooling effect required by the drawings and the specifications.

3.6 INSTALLATION

A. Automatic Glycol Feed Package, complete with valves and piping, as recommended by the equipment manufacturer and indicated on the drawings.

B. Glycol System(s): following system cleaning, fill specified glycol system and feed tank to indicated percentage of glycol/water solution indicated. Glycol feed tank shall be topped off at project closeout.

C. Connections or extension of existing glycol piping systems: Prior to connecting to the existing system(s), the Mechanical Contractor shall take sample of fluid and provide test reports of the existing fluids concentration of glycol and residuals to the Engineer for acceptance. If the test results have not been provided prior to connection, the Mechanical Contractor shall be held responsible in bringing the entire hydronic system within acceptable specifications. The Mechanical Contractor shall top off the new or existing glycol feed tank, at project closeout.

END OF SECTION 230593

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230594

BALANCING OF SYSTEMS

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 RELATED WORK SPECIFIED ELSEWHERE

Cleaning and Testing: Section 230593

1.3 SUBMITTALS

A. Quality Control Submittals:

1. Testing, Adjustment and Balancing Reports: Submit final testing and balancing results on applicable report forms, as approved or furnished by the environmental systems balancing council or bureau, which is certifying the independent member agency performing the Work, required by this Section. Each final systems report form shall bear the signature of the person performing the Work and recording the data and the signature of the certified supervisor for the performing agency. Submit simultaneously with the final reports, a list of the instruments used with the last date of calibration for each instrument.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Provide the services of a certified independent agency for the testing, adjustment and balancing of all air distribution and hydronic distribution systems complete with all connected apparatus and equipment. The agency shall be certified by the Associated Air Balance Council Bureau - AABC, Washington, DC 20005, National Environmental Balancing Bureau - NEBB, Arlington, Va. 22209 or by pre-approval of the engineer.

2. The Work shall be performed by skilled mechanical technicians under the direct supervision of certified personnel in the employ of the independent agency. The supervisor shall be personally certified by the national council or bureau, as approved by the Engineer.

1.5 SEQUENCING AND SCHEDULING

A. Scheduling:

1. Perform environmental systems testing and balancing after cleaning, miscellaneous testing, adjustment and operational testing Work has been completed.

2. Test and balance system during a period of time when outside temperature conditions will impose a significant load on the system; i.e., summer months for air conditioning system, winter months for heating system. Balance and adjust systems accordingly. Return to the site as required.

3. Send written notification to the Owner's Representative a minimum of five days prior to the performance of testing and balancing Work. Perform testing and balancing Work in the presence of the Owner's Representative.

1.6 ACCURACY

A. Outlets and equipment shall be balanced to within 5% of design airflows. Portions of systems unable to be balanced to these criteria shall be brought to the attention of the Engineer.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. General Information: Test instruments are included in this specification for information only. Balancing of air and hydronic systems shall be performed by qualified personnel utilizing company owned test instruments, which will remain the property of the company. Use test instruments which are in first class operating condition, with individual calibration histories to guarantee their accuracy. Test instruments shall be of type and kind as required by the type of system installed. Trade names and manufacturer's names are mentioned in this section for descriptive purposes only; instruments of equivalent range and capabilities may be utilized.

B. Air Balancing Instruments:

1. Manometers: Inclined with ranges of 0 to 1/4" and 0 to 1"; Combination inclined and vertical with a range of 0 to 5" and U tube type, 18".

2. Portable "Magnehelic" Draft Gages: Ranges 0 to 1/2", 0 to 1" and 0 to 5".

3. Anemometers: Deflecting vane type with a range of 100 to 3000 fpm, similar to Alnor Velometer Model 6000 BP and 4" diameter rotating vane type.

4. Pitot Tubes: ASHRAE standard type, stainless steel, 5/16" diameter, lengths as required.

5. Sling Psychrometer.

6. Smoke Candles and Smoke Generator.

7. Flowhoods with hoods to match air outlet sizes used on project.

C. Hydronic Balancing Instruments:

1. Calibrated Test Gages: Ranges 0 to 30 lbs., 0 to 60 lbs., 0 to 200 lbs.

2. Calibrated Test Gages (Compound Type): Ranges from -30" to 30 lbs. and -30" to 60 lbs.

3. U Tube Manometer: 36".

D. Air and Hydronic Systems Balancing Instruments:

1. Thermometers: 12" mercury column type and dial type, with a range of -40 to +120 degrees F. and 0 to 220 degrees F. Total of four thermometers.

2. Universal Hand Tachometer: Herman H. Sticht Type UH.

3. Stop Watch.

4. Stroboscope.

5. Contact Pyrometer: Thermocouple type.

6. Volt-Ohm-Ammeter Test Kit, High Current Type: Sperry "Ohmprobe".

7. Volt-Ammeter: With leads for connecting to lugs.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Inspection: Prior to the environmental testing and balancing of hydronic and air distribution systems, the certified supervisor in the employ of the testing and balancing agency shall inspect the installations and notify the Owner's Representative of any Work which must be performed or modified prior to initiating testing and balancing procedures.

B. Performance: Test and balance environmental hydronic and air distribution systems, including all connected equipment and apparatus, so as to conform to the design conditions. Perform the Work of this section in accordance with the published standards of the balancing council or bureau, which is certifying the member firm. Record all test readings, calculations and results.

END OF SECTION 230594

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230713

DUCT INSULATION

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 RELATED WORK SPECIFIED ELSEWHERE

Common Work Results for HVAC: Section 230500
Ductwork Accessories: Section 233300

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Insulation Schedule: Schedule shall list all systems and indicate by system the type of insulation, jacketing, etc, to include manufacturer's model number and size for each service application.

C. Product Data for each Insulation type. Manufacturer's catalog sheets, specifications, and installation instructions for each item specified, excluding Miscellaneous Materials.

1.4 QUALITY ASSURANCE

A. Qualifications: The persons and supervisors performing the Work of this section shall be personally experienced in installing insulation and shall have been regularly performing such work for a minimum of 3 years while in the employ of a company or companies engaged in the installation of piping insulation.

B. Regulatory Requirements:

1. Fire and Smoke Hazard Ratings: Duct insulation installed inside a building, duct lining materials, Class 1 and 2 jacketing materials, mastics, and adhesives shall have a maximum flame spread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Insulation for ductwork shall be fibrous glass with a factory applied laminated foil - scrim - kraft jacket of Class as specified and as follows:

1. (Type-1) Fiberglass Board insulation with a factory applied Class 1 jacket. Preformed, flat, rectangular rigid material, R-Value as specified, having a density of 3.0 pcf, a thermal conductivity (k value at 75 degrees F.) of 0.23 conforming to ASTM C612, with a factory applied Class 1 jacket.

2. (Type-2) Fiberglass Flexible Board insulation with a factory applied Class 1 jacket. Preformed, flat, rectangular rigid material, R-Value as specified, having a density of 3.0 pcf, a thermal conductivity (k value at 75 degrees F.) of 0.23 conforming to ASTM C612, with a factory applied Class 1 jacket.

3. (Type-3) Fiberglass Blanket insulation with a factory applied Class 2 jacket. Roll type, flexible material, R-Value as specified, having a density of 1.0 pcf, a thermal conductivity (k value at 75 degrees F.) of 0.27, conforming to ASTM C553 with a factory applied Class 2 jacket.

4. (Type-4) Flexible Sheet Foam Plastic insulation. Chemically expanded unicellular elastomeric material possessing the following physical characteristics: R-Value as specified. Flexible sheet form having a density of 6 pcf; a thermal conductivity (k value at 75 degrees F.) of 0.28 max.; operating temperature range of -20 to 200 degrees F., and a self-extinguishing fire resistance rating in accordance with ASTM D1692.

B. Insulation Values: Provide the specified insulating value as required, the insulation value shall be the **installed** R-Value

2.2 JACKET MATERIALS

A. When conditions permit, factory applied jacketing materials to insulation.

B. Laminated Jacket:

1. (Class-1) Permanent, fire resistant, non-corrosive type having a UL flame spread rating of 25 or less, a fuel contributed and smoke developed rating of 50 or less, a vapor transmission rate of 0.02 perms or less. Jacket materials shall be as follows:

a. (Class-1) - Heavy duty 0.7 mil thick aluminum foil and white kraft paper laminate, reinforced with glass fiber scrim or fiber glass yarn, not less than 4 per inch in both directions.

2.3 ADHESIVES, SEALANTS AND CEMENTS: (CEREAL BASE ADHESIVES WILL NOT BE ACCEPTED).

A. Vapor Seal Adhesive: B. Foster 85-20, Childers' CP-82, or Epolux Cadaprene 400.

B. Vapor Barrier Mastic: B. Foster 30-35, Childers' CP-30, or Epolux Cadalar 670.

C. Joint Sealer for use with Fibrous Glass Insulation: B. Foster 30-45, Childers' CP-30 or Epolux Cadalar 670.

D. Adhesive for Flexible Foamed Plastic: Armstrong Cork Co. 520, B. Foster 82-31, Childers' CP-80 or Epolux Cadaprene 488.

2.4 MISCELLANEOUS MATERIALS

A. Duct and Equipment Insulation Fasteners: Weld pin type complete with a speed washer, or suitable clip for supporting the insulation. Fasteners shall be Graham Weld Pins, Duro Dyne Spotter Pins or Clip Pins.

B. Sealing Tape for Sealing Joints in Duct Insulation: Same materials as the jacket, as manufactured by Arno Adhesive Tapes, Inc., Compac Corp., Fasson or Morgan Adhesive Company.

C. Metal Corner Angles: 2" x 2" x 28 gage galvanized sheet metal.

D. Prefabricated Metal Corner Angle Tape: Minimum 28 gage flexible metal bonded to vapor barrier material of the same Class as the insulation jacketing material.

E. Ductwork Insulation Filler Pieces: Preformed, flat, rectangular material, of thickness as specified, having a density of 6 pcf, conforming to ASTM C612.

PART 3 EXECUTION

3.1 PREPARATION

A. Preliminary Work: Clean and dry ductwork, prior to insulating.

3.2 INSTALLATION, GENERAL

A. A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, except as specified otherwise

3.3 INSTALLATION

A. General: Provide insulation as scheduled below, as a minimum, insulate all HVAC systems provided in this project in compliance with 2020 Energy Conservation Construction Code of New York State. Where the insulation scheduled or noted in the construction documents exceeds the Energy Code, the greater requirement shall be provided. HVAC Systems provided but not indicated in the schedule below, however require insulation per the Energy Code, shall be provided as part of this project.

APPLICATION	MAT'L	THICKNESS / [Min. R-VALUE]	JACKET	ADD'L
Supply Duct				
Above ceilings	Type-3	2" [R-6]	Class-1	
Above ceilings, under insulated roofs.	Type-3	2" [R-6]	Class-1	
Above insulated ceilings, under roofs	Type-1	3" [R-12]	Class-1	
Exposed in finished spaces (1)	Type-1	1-1/2" [R-6]	Class-1	
Exposed in un-finished spaces (2)	Type-1	1-1/2" [R-6]	Class-1	Class-2
Exposed in un-conditioned spaces	Type-1	1-1/2" [R-6]	Class-1	Class-2 (3)
Non accessible, un-conditioned spaces (4)	Type-1	3" [R-12]	Class-1	
Return Duct				
Above ceilings	None			
Above ceilings, under insulated roofs.	None			
Above ceilings, return air plenums	None			
Above insulated ceilings, under roofs	Type-1	3" [R-12]	Class-1	
Exposed in finished spaces (1)	Type-1	1-1/2" [R-6]	Class-1	
Exposed in un-finished spaces (2)	Type-1	1-1/2" [R-6]	Class-1	Class-2
Exterior of the building, Rectangular duct construction.	Type-1	3" [Min R-12] (7)	Class-1	Class-3

Exterior of the building, Round duct construction	Type-1	3" [R-12]	Class-1	Class-3
Exposed in un-conditioned spaces	Type-1	1-1/2" [R-6]	Class-1	Class-2 (3)
Non accessible, un-conditioned spaces (4)	Type-3	3" [R-12]	Class-1	
OA Duct				
Above ceilings	Type-3	2" [R-6]	Class-1	
Exposed in finished spaces	Type-1	1-1/2" [R-6]	Class-1	
Exposed in un-finished spaces (2)	Type-1	1-1/2" [R-6]	Class-1	Class-2
Exposed in un-conditioned spaces (3)	Type-1	1-1/2" [R-6]	Class-1	Class-2 (4)
Non accessible, un-conditioned spaces (5)	Type-3	3" [R-6]	Class-1	
Exposed in un-conditioned OA mixed with RA	Type-1	1-1/2" [R-6]	Class-1	Class-2 (4)
OA mixed with RA Duct **(8)**				
Above ceilings	Type-3	2" [R-6]	Class-1	
Exposed in finished spaces	Type-1	1-1/2" [R-6]	Class-1	
Exposed in un-finished spaces (2)	Type-1	1-1/2" [R-6]	Class-1	Class-2
Exposed in un-conditioned spaces (3)	Type-1	1-1/2" [R-6]	Class-1	Class-2 (4)
Non-accessible, un-conditioned spaces (5)	Type-3	2" [R-6]	Class-1	
Exposed in un-conditioned OA mixed with RA	Type-1	1-1/2" [R-6]	Class-1	Class-2 (4)
Exhaust Air Duct				
Above ceilings (6)	Type-3	2" [R-6]	Class-1	
Exposed in finished spaces (6)	Type-1	1-1/2" [R-6]	Class-1	Class-2
Relief Air Duct				
Above ceilings (6)	Type-3	2" [R-6]	Class-1	
Exposed in finished spaces (6)	Type-1	1-1/2" [R-6]	Class-1	Class-2

Comments:

1. Ductwork serving the same space in which it serves, and is exposed to view, duct insulation is not required. When ductwork is exposed to view, but does not serve the space where exposed, ductwork shall be insulated as scheduled.

2. Unfinished spaces, which are considered utility use, such as: Boiler rms, mechanical equipment, fan rms, electrical rms, store rms, janitor, basements, and service passages.

3. Un-conditioned spaces: which have no heating or cooling means, such as garages, loading docks.

4. Provide jacket to 96" AFF.

5. Non-accessible and unconditioned spaces: crawl spaces, above ceilings of spaces not conditioned

6. Ductwork between exterior of the building and damper (control or back draft).

7. Provide on flanged duct, one layer 1-1/2" board without vapor barrier between duct flanges followed by a continuous layer of 1-1/2" board with vapor barrier, with the exterior membrane wrap applied.

8. OA mixed with RA, defined as: OA non-tempered outside air (IE: heated or cooled by mechanical means) combined with RA (return air) ductwork.

B. Board Insulation:

1. Board Insulation Application:

a. Secure insulation to ductwork, with duct insulation fasteners spaced 3" in from all corners of ducts, with intermediate fasteners on maximum 16" centers in all directions. Butt all edges of insulation and fill all voids with similar insulation.

b. Install board type insulation with a Class 1 jacket. When ductwork cross seams, angle bracing or reinforcing are higher than the insulation thickness, increase insulation thickness to be equal to or greater than the H (height) dimension of the cross seam, angle bracing or reinforcing member.

c. Seam minimum 1½" wide longitudinal jacket laps continuously with vapor barrier lap adhesive. Lap circumferential joints with 4" wide jacket material and seal laps continuously with vapor barrier lap adhesive, or seal continuously with a minimum 3" wide pressure sensitive sealing tap, of the same material as the jacket. Install metal corner angles or prefabricated corner angle tape, over the jacketed insulated corners. Seal exposed ends of insulation with vapor barrier mastic. Vapor seal all breaks in vapor barrier jacketing, all exposed surfaces of duct insulation fasteners and metal corner angles, with pressure sensitive sealing tape of the same material as the jacket or coat with vapor barrier mastic.

d. Trapeze Hangers: Place trapeze hangers, fabricated of steel rods and structural steel channels or angles, outside the jacketed insulated ducts. Install high-density insulation pieces, of thickness equal to the insulation, a minimum of 4" in width by the bottom dimension of the duct, at all points of support. Continuously jacket all insulated ducts and filler pieces through all supports.

e. Miscellaneous Board Insulation Application: Insulate air handling equipment, not furnished with a factory applied insulated jacket or internal insulation as specified under sections of this specification, with fibrous glass board with a Class 1 jacket, installed and finished as specified for exposed ductwork in a finished space.

f. Provide Flexible board: When surface applications are not conducive for the use rigid board insulation. For use on round or radius equipment or ductwork. Application of flexible board insulation shall be as directed for rigid board application.

C. Blanket Insulation:

1. Blanket Insulation Application: Install insulation with all longitudinal joints overlapped a minimum of 2" and butt or lap all circumferential joints. Secure longitudinal and circumferential joints with flare door staples. Install duct insulation fasteners on the bottom side of all horizontal duct runs, when the bottom dimension of the duct is in excess of 32" in width. Install duct insulation fasteners on the sides of all duct risers having a dimension over 24" in size. Space fasteners in accordance with the following schedule:

DUCT DIMENSION	SPACING OF FASTENERS (Min.)
Up to 32"	None required on horizontal runs, 1 row – 16" on center on all duct riser sides over 24" in size.
33" to 48"	2 rows – 16" on centers
49" to 60"	3 rows – 16" on centers

61" and over	16" on center in all directions.

2. Trapeze Hangers: Place trapeze hangers, fabricated of steel rods and structural steel channels or angles, outside the jacketed insulated ducts. Install high-density insulation pieces, of thickness equal to the insulation, a minimum of 4" in width by the bottom dimension of the duct, at all points of support. Continuously jacket all insulated ducts and filler pieces through all supports.

D. Bench Insulated Ductwork:

1. Insulate ducts prior to erection in place when ducts are required to be installed proximate to walls, ceilings, equipment, structural steel or other ductwork, which will not permit adequate space for the installation of insulation, at a later date. Exercise reasonable care in the installation of bench insulated ductwork, so that insulated surfaces are in perfect condition before and after installation.

3.4 SCHEDULE OF ITEMS NOT TO BE INSULATED

A. Do not insulate the following ductwork items:

1. Energy Recovery Ventilators.
2. Exhaust fans.
3. Heat pumps.
4. VAV Boxes.
5. Flexible fabric ductwork connections.

3.5 FIELD QUALITY CONTROL

A. Field Samples: The Owner's Representative may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Re-insulate sample cut areas.

END OF SECTION 230713

SECTION 230719

PIPING INSULATION

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 RELATED WORK SPECIFIED ELSEWHERE

Pipe Hangers and Supports: Section 230529.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Insulation Schedule: Schedule shall list all systems and indicate by system the type of insulation, jacketing, etc, to include manufacturer's model number and size for each service application.

C. Product Data for each Insulation type. Manufacturer's catalog sheets, specifications, and installation instructions for each item specified, excluding Miscellaneous Materials.

1.4 DEFINITIONS

A. Cold Service Insulation: Insulation on piping and/or equipment conveying fluids at below ambient temperatures.

B. Hot Service Insulation: Insulation on piping and/or equipment conveying fluids at above ambient temperatures.

C. Dual temperature service shall follow cold service requirements.

1.5 QUALITY ASSURANCE

A. Qualifications: The persons and supervisors performing the Work of this section shall be personally experienced in installing insulation and shall have been regularly performing such work for a minimum of 3 years while in the employ of a company or companies engaged in the installation of piping insulation.

B. Regulatory Requirements:

1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

PART 2 PRODUCTS

2.1 INSULATION

A. (Type-A) Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.

1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM 547:
    a. Class 1 (Suitable for Temperatures Up to 450 degrees F): K of 0.26 at 75 degrees F.
2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75 degrees F; ASTM C 547, Class 1.
3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75 degrees F; ASTM C 553, Type III.
    a. Suitable for temperatures up to 450 degrees F.

B. (Type-B) Flexible Elastomeric Foam Insulation:

1. FM tested and approved, meeting the following:
    a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
    b. K of 0.27 at 75 degrees F based on ASTM C 518 or C 177.
    c. Fire Spread/Smoke Developed Rating: 25/50 or less based on ASTM E 84.
2. Pipe Insulation: ASTM C 534, Type I.
3. Polyethylene and polyolefin insulation is not acceptable.

2.2 JACKET MATERIAL

A. All Purpose Jacket: Vapor barrier type, factory or field applied over fiberglass insulation, comprised of a Kraft paper outer cover bonded to aluminum foil, and reinforced with fiberglass yarn. Jacket material shall be treated for permanent fire and smoke resistance. A vapor barrier jacket seal shall be accomplished with a 1-1/2" longitudinal flap, and 3" wide butt strips, factory supplied, for making circumferential joints.

1. Fire and Smoke Hazard Classification Rating (composite, including jacket and adhesive, ASTM E-84):
    a. Flame Spread: 25 or less.
    b. Smoke Developed: 50 or less.
2. Water Vapor Permeability (ASTM E-96): 0.02 perm.
3. Tensile Strength: 40 lb./in. width.
4. Mullen Burst: 70 psi.

B. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, factory cut and rolled to indicated sizes, fittings and pipe. As manufactured by: ITW Insulation Systems Houston Texas, Pabco-Childers or approved

1. Finish and Thickness: Smooth finish, 0.016 inch thick.

2. Moisture Barrier: 3-mil Dupont Surlyn.

2.3 FITTING INSULATION

A. Fiberglass Insulation System:

1. Pre-molded fitting insulation: Same thickness as the adjacent pipe covering.

a. Conform to FS-HH-I-558C, Form E, Class 16.

2. PVC/Fiberglass Fitting Insulation: Polyvinyl chloride pre-molded flexible fitting cover with batt type, pre-cut fiberglass insert.

a. PVC: Conform with FS L-P-535C, Composition A, Type II, Grade GU.

b. Fiberglass: Conform with FS HH-I-558C, Form B, Type I, Class 7&8.

3. Miter Cut Fitting Insulation: Fabricated from materials employed for pipe insulation.

B. Flexible Elastomeric Foam Insulation System: Miter cut fitting insulation, fabricated from materials employed for pipe insulation.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive:

1. Vapor Barrier Jacket Adhesive: Foster Products Division, 85-20, Childers, CP-82, Epolux, Cad-o-prene, 400.

2. Reinforcing Membrane Adhesive: Foster Products Division 30-36; Childers, CP-50; Epolux, Cadalag 336.

3. Flexible Elastomeric Foam Adhesive: Foster Products Division, 85-75; Epolux, Cad-o-prene, 488; Armstrong, 520.

B. Joint Sealant for Fiberglass Insulation: Foster Products Division, 30-45; Childers, CP-30; Epolux, 670.

C. Vapor Barrier Coating: Foster Products Division, 30-35; Childers, CP-30; Epolux, 670.

D. Cement:

1. Insulating Cement: ASTM C195, asbestos free.

2. Finishing Cement: ASTM C449/C449M.

E. Reinforcing Membrane:

1. Polyester Cloth: 8 x 8 mesh per sq. in., 0.7 oz. per sq. yd.; Foster Products Division, Mast-a-fab.

2. Glass Yarn Cloth: 20 x 20 mesh per sq. in.; Johns-Manville, Duramesh fabric.

F. Sealing Tape: Vapor barrier, color matching, of same material as the pipe or fitting cover to which applied; as manufactured by Arno Inc., Compac Corp., Fasson Adhesive Co.; or as recommended by the manufacturer of the jacket material to which applied.

G. Banding Wire: Steel, 20 gauge, galvanized; annealed.

H. Thumb Tack Fastener: Stainless steel, with serrated shank.

I. Insulation Inserts (for Hangers and Supports):

1. Inserts, High Density Insulation for use with Fibrous Glass Insulation:

a. Cold Service Piping:

1) Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75 degrees F, minimum compressive strength of 125 psi.

b. Hot Service Piping:

1) Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300 degrees F; ASTM C 533.

2) Perlite: Minimum density 12 pcf, K of 0.60 at 300 degrees F; ASTM C 610.

c. Inserts for use with Elastomeric Foam Insulation only:

1) Cold and Hot Service Piping:

a) Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

J. Wood Blocks: Hardwood, preservative treated; 1" wide, 3" minimum length; inner and outer surfaces contoured to fit the curvature of the pipe, and insulation shield. Wood blocking is not acceptable for use on heating systems with fiberglass insulation, and will require removal if used.

K. Wood Dowel Plugs: Hard wood, preservative treated.

L. Wood Preservative: Pentachlorophenol, 5% solution, 3 minute dip.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not install insulation until the piping Work has been tested and accepted.

B. Clean and dry all Work to be insulated prior to applying insulation.

3.2 INSTALLATION, GENERAL

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, except as specified otherwise.

3.3 INSTALLATION OF FIBERGLASS INSULATION

A. Seal jacket longitudinal flap with vapor barrier jacket adhesive. Rub out all wrinkles and smooth excess sealant flush with outer surface of jacket.

B. Apply a coating of vapor barrier jacket adhesive to butt ends of each section of insulation to be joined, and apply butt strips in like manner as above. Apply butt strips to overlap 1-1/2" on each side of the sections joined.

C. PVC/Fiberglass Fitting Insulation: Tuck the ends of the pre-cut insulation batt snugly into the throat of the fitting, tuft and tuck-in the edges adjacent to the pipe insulation. Install fitting cover and seal as follows:

1. Cold Service Insulation: Seal the overlap in the throat of the fitting cover, and the butt joint of the cover with the adjacent pipe insulation, with vapor barrier mastic and 2" wide sealing tape (a product of the fitting cover manufacturer). Extend the tape 1" over the adjacent pipe insulation and overlap upon itself at least 2" on the downward side.

2. Hot Service Insulation: Secure the cover with staples, thumb tack fasteners, or sealing tape.

D. Pre-Molded and Miter Cut Fitting Insulation: Insulate to the same thickness as the adjoining pipe insulation. Apply joint sealant to the mating edges of the sections, and to the butt joint. Secure sections together with banding wire; bend twisted ends into the insulation. Apply a leveling coat of insulating cement to fill the voids and smooth irregularities.

1. Cold Service Insulation: Cover fitting insulation with two 1/8" thick applications of vapor barrier coating, with a layer of reinforcing membrane bedded between coats. Lap membrane at least 2" over itself, and the adjacent pipe insulation. Apply a 6 ounce canvas jacket over the fitting, secured with adhesive. Lap canvas at least 2" over itself, and the adjacent pipe insulation.

a. Omit canvas on concealed installations.

2. Hot Service Insulation: Apply a 6 ounce canvas jacket to the fitting insulation, secured with adhesive. Lap canvas at least 2" over itself.

a. Omit canvas on concealed installations.

E. Vapor Stop for Cold Service Insulation:

1. Pipe Insulation: At 21 foot intervals of horizontal, and 9 foot intervals of vertical pipe insulation, also at each fitting insulated with pre-molded or miter cut fitting insulation, apply a 1/16" thickness of vapor barrier coating to the butt end, and 2" into the bore of each joining section before assembling.

2. Insulation Termination; Metal to Insulation Joints; Protrusions Through Insulation:

a. a. Apply a vapor barrier coating to completely seal the joint and extend over adjacent insulation and metal a maximum of 3 inches.

b. Embed reinforcing membrane into the coating, covering the complete coated surface; smooth out wrinkles.

c. Apply a heavy application of vapor barrier coating over the entire surface, leaving a large bead or fillet at the joint between metal and insulation.

F. Insulated Piping Exposed to view in finished spaces:

1. Provide PVC pipe and fitting jacketing, from 8'-0" aff or finished ceiling (which ever is higher) down to point of concealment.

G. Insulated Piping installed exterior to the building, exposed to the elements:

1. Pipe supports shall not be in direct contact with pipe, supports must to the exterior of the insulation and jacketing.

2. Provide continuous Aluminum pipe and fitting jacketing, caulked / sealed weather tight, from exit point of building to termination point (to include termination connections).

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive. Where the slip-on technique is not possible, slit the insulation and install; re-seal with adhesive, making sure the mating surfaces are completely joined.

B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.

1. Insulate threaded fittings and valves with sleeved fitting covers. Over lap and seal the covers to the adjoining pipe insulation.

C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

D. Insulated Piping installed exterior to the building, exposed to the elements:

1. Pipe supports shall not be in direct contact with pipe, supports must to the exterior of the insulation and jacketing.

2. Apply two coats of weatherproof mastic, on piping where the insulation OD is 3" or less.

3. Provide continuous Aluminum pipe and fitting jacketing, caulked / sealed weather tight, from exit point of building to termination point (to include termination connections).

3.5 INSTALLATION AT HANGERS

A. Reset and realign hangers and supports if they are displaced while installing the piping insulation.

B. Direct hanger or clamp contact of pipe for hot or cold piping is not allowed.

C. Fiberglass Insulation: Install high density insulation filler pieces, at all points of support, between pipe insulation shields and pipe or tubing on pipe or tubing 2" and larger. Do not install high-density insulation filler pieces on piping or tubing scheduled to have steel saddles. Install filler pieces of the same thicknesses as adjoining pipe insulation and 2" longer than the insulation shield of the following materials:

1. Install high density molded polyurethane or high-density polystyrene filler pieces, for pipe or tubing insulated with fiberous glass.

D. Flexible Elastomeric Foam Insulation: Install wood blocking or wood dowel plug filler pieces of the same thickness as the insulation. Slot the insulation, insert the filler pieces between the pipe and insulation shield, and secure in place with adhesive. Install filler pieces as follows:

PIPE/TUBING SIZE	FILLER PIECES	POSITION
Thru 1½"	2 dowel plugs	6 o'clock; in tandem
2" thru 4"	1 block 2 dowel plugs	6 o'clock, and 4&8 o'clock, respectively
6" thru 8"	2 blocks 4 dowel plugs	6 o'clock; in tandem and 4&8 o'clock; in tandem

3.6 INSULATION SCHEDULES

A. General: Provide insulation as scheduled below, insulate all HVAC systems provided in this project in compliance with NYS Energy Code. Where the insulation scheduled or noted in the construction documents exceeds the Energy Code, the greater requirement shall be provided. HVAC Systems provided require insulation per the Energy Code, but not indicated in the schedule below, shall be insulated as part of this project.

APPLICATION	PIPE SIZE	TYPE	MINIMUM THICKNESS	ADD'L
Heat Pump Load Loop Heating	1-1/4" or less	A	1"	
	1-1/2" and above	A	1½"	
Building Heat Pump Loop/ Heat Pump Load Loop Cooling	1-1/4" or less	A or B	½"	
	1-1/2" and above	A or B	1"	
Condensate Drain (CD)	1-1/4" or less	A or B	1/2"	
	1-1/2" and above	A or B	1"	
Refrigerant	1-1/4" or less	B	1½"	
	1-1/2" and above	B	2"	
Cold Services: Equipment, vessels and appurtenances for conveying, storing or processing materials, at or below ambient temperature	All	A or B	1½"	
Hot Services: Equipment, vessels and appurtenances for conveying, storing or processing materials, at or above ambient temperature	All	A or B	1½"	

Insulate all cold and hot service equipment in accordance with the schedule, except the items listed below:

a) Air vents, pressure reducing valves; relief valves.

b) Flexible connectors.

c) Items installed by others, unless otherwise specified herein.

B. Install all cold and hot service insulation intact through pipe sleeves, and openings in building construction, maintaining the vapor barrier integrity of the system.

C. Insulate valve bodies up to but not including the packing nuts.

D. Flanges and mechanical couplings and fittings (grooved fittings) shall be insulated with the insulation thickness specified for that system. Provide molded PVC fitting on all grooved fittings.

E. Coordinate with the equipment manufacturers requirements, provide field insulated equipment components or system components as recommended (IE: refrigerant line, boiler headers, cross over piping, etc) per manufacturer.

F. Insulation Options: Option 2 may be used for temperatures to 200 degrees F and on sizes of 2 inches and under. Use fiberglass on pipe and equipment sizes of 2-1/2 inches and larger. Do not inter mix insulation types on individual runs of piping. Provide option 1 for all insulated piping exposed to view.

1. Option 1: Fiberglass pipe and/or equipment insulation, with PVC/fiberglass fitting insulating system.

2. Option 2: Flexible elastomeric foam pipe and/or equipment insulation, with miter cut fitting insulation.

3.7 FIELD QUALITY CONTROL

A. Field Samples: The Owner's Representative may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Re-insulate sample cut areas.

END OF SECTION 230719

SECTION 230800

COMMISSIONING OF HVAC SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. This section includes general requirements that apply to implementation of the commissioning process without regard to specific systems, assemblies, and components.

B. Related Sections including the following:

1. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.

2. Division 26 Section "Commissioning of Electrical" for commissioning process activities for electrical systems, assemblies, equipment and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document, prepared by Architect, that record concepts, calculations, decisions, and product selection used to meet the OPR and to satisfy applicable regulator requirements, standard and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document, prepared by Owner that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Assemblies, Equipment and Components: Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, equipment and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.

2. Representatives of the facility user and operation and maintenance personnel.

3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documents to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor and their subcontractors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

2. Cooperate with the CxA for resolution of issues recorded in "Issues Log."

3. Attend and participate in commissioning team meetings held on a variable basis.

4. Integrate and coordinate commissioning process activities with construction schedule.

5. Review and accept construction checklist provided by the commissioning authority.

6. Complete paper or electronic construction checklists as Work is completed and provide to the commissioning authority on a monthly basis.

7. Review and accept commissioning process test procedures provided by the commissioning authority.

8. Accomplish commissioning process test procedures.

1.7 CXA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan

C. Convene commissioning team meetings.

D. Provide Project-specific pre- functional checklist templates, readiness forms, functional checklist procedures, construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using 100 percent of all systems commissioned. Verification will include, but is not limited to, document review, equipment submittals review, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, CxA will report the failure in the "Issue Log."

F. Prepare and maintain defieciencies/ issues log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning process report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

A. Systems to be commissioned shall include, but not limited to the following systems and equipment. Contractor shall coordinate with the commissioning agents Cx plan for a complete list of systems and equipment.

1. Mechanical Systems

a. Geothermal Ground Loop and Primary Pumping Loop System

b. Geothermal Secondary Loop Pumping System

c. Variable Speed Drives

d. Water to Water Heat Pump Units Systems

e. Water to Air Heat pumps

f. Energy Recovery Unit System

g. Ductwork Distribution Systems

h. Piping Distribution Systems

i. Humidification System

j. PSAP and EOC Variable Air Volume Boxes

k. Server Room DX Cooling System including Indoor units, CFM/TON Verification, Humidification, Safeties, Alarms, Monitoring, Outdoor Units

l. Exhaust Fans

m. Electrical Heating Elements

n. Constant volume air valves

2. Automatic Temperature Controls

3. Requirements for Functionally Testing Mechanical System:

a. Deficiency list items are closed, pre-functional checklists are completed and signed off, Temperature control contractor has completed point to point check, Complete Building Testing Adjusting and Balancing is complete and readiness forms are completed and returned to CxA,

4. Functional Testing shall be performed during peak heating and peak cooling season.

a. Deferred testing is required.

END OF SECTION 230800

SECTION 230865

EXHAUST FANS

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 RELATED WORK SPECIFIED ELSEWHERE

Wiring of Mechanical Equipment: Section 230889
Metal Ductwork: Section 230891
Motor Controls: Section 230950

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, performance charts, specifications and installation instructions for each size fan specified.

B. Contract Closeout Submittals: Operation and Maintenance Data: Submit 2 copies to the Engineer, incorporated within maintenance manuals, covering the installed products.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Fan ratings shall be approved by AMCA, and shall be based upon tests performed in strict accordance with the Test Code adopted jointly by AMCA and ASHRAE. Each fan shall bear, near the manufacturers' nameplate, the seal authorized by AMCA indicating that ratings are certified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Greenheck
Carnes
Cook

2.2 IN-LINE CENTRIFUGAL FAN:

A. Axial Flow Fans - General

1. Design Criteria: Design fans for a maximum air temperature of 150 degrees F.

2. Fan Housings: Fabricate housings from heavy gage sheet steel all welded construction, properly reinforced to prevent "breathing" and vibration at all fan speeds. Housings shall be complete with deep spun or die formed inlet cones, fan assembly supports and access openings where required. Provide housing end angle collars, with drilled or punched holes at uniform intervals, extending beyond the duct housing to provide continuous duct connections. Provide heavy gage steel support legs supports, welded to housing, all as required by the particular application.

3. Fan Wheels: Non-overloading, backward inclined, centrifugal design with extruded aluminum blades. Wheels over 12" in diameter shall be of the airfoil design with extruded aluminum airfoil blades.

4. Conversion Vanes: Fan assemblies, with wheels over 12" in diameter shall be complete with multiple airfoil type conversion air vanes, installed on the discharge side of the fan.

5. Electric Motors: Ball bearing type, designed for use with the electric service characteristics indicated on the drawings.

B. V-Belt Drive Fans

1. Fan assembly shall be located within the fan housing and shall be V-belt driven by an electric motor, supported on an adjustable motor base, welded to the exterior of the housing. Provide solid steel fan drive shaft, accurately turned and polished, mounted on heavy duty lifetime lubricated pillow block ball bearings. Isolate bearings and drive from air stream. Run V-belt drive, between fan assembly and motor, in a rigid, airtight, sheet metal enclosure. Provide all moving parts of fan assembly with vibration isolation and install motor on resilient mountings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ALL fans of type and size as shown on drawings. Provide with vibration isolation devices, anchor bolts and supports to make a whole and complete system.

B. Install all fans as per manufacturer's installation instructions.

END OF SECTION 230865

SECTION 230923

DIRECT DIGITAL CONTROL SYSTEM

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 RELATED WORK SPECIFIED ELSEWHERE

Mechanical Division 23
Sequence of Operations for HVAC Contorls 230993
Electrical Division 26

1.3 SCOPE OF WORK

A. Furnish all labor, materials, tools, equipment, and services for a fully integrated and networked energy management control system (EMS) as indicated, in accordance with provisions of contract documents.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intents of this specification, shall be included in Contractor's bid and provided without additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. The EMS shall be installed by competent mechanics and checked out by competent technicians regularly employed by the manufacturer of the equipment or licensed franchises authorized by the manufacturer.

B. Single source responsibility shall include installation, calibration, and check-out of the stand-alone systems and network.

C. The EMS installer shall have an in-place, local support facility with technical staff, spare parts inventory, and all necessary test diagnostic equipment.

1.5 REFERENCED STANDARDS, CODES AND ORDINANCES

A. The latest issue of applicable standards and recommended practices of the following agencies in effect shall form a part of the specification to the extent each agency s relative standards or recommended practices apply to the Systems and its components as specified herein.

1. Federal Communications Commission (FCC)

2. American National Standards Institute (ANSI)

3. American Society of Mechanical Engineers (ASME)

4. Electronic Industries Association (EIA)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories (UL)
9. Occupational Safety and Health Administration (OSHA)
10. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

B. All systems equipment, components, accessories, and installation hardware shall be new and free from defects and shall be UL listed where applicable. All components shall be in current production and shall be a standard product of the system or device manufacturer. Refurbished or reconditioned components are unacceptable. Each component shall bear the make, model number, device tag number (if any), and the UL label as applicable. All systems components of a given type shall be the product of the same manufacturer.

1.6 SUBMITTALS & OPERATION AND MAINTENANCE MANUALS

A. Provide eight (8) copies of shop drawings of the entire control system and submittals on hardware, software, and equipment to be installed or furnished. Begin no work until submittals have been approved for conformity with design intent. Control shop drawings shall be on 11"x17" paper and shall contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system.

B. All control system components shall be shown on control shop drawings and shall be identified in respective shop drawing bill of material. Bills of material shall include brief description of each system component, component part number and component device tag.

C. Over- **and** under-voltage protection apparatus for all system controllers as specified in Power Supplies and Power Conditioning later in this document shall be shown on the control shop drawings and identified in the bills of material.

D. Wiring diagrams and layouts for each control panel and terminal identification for all control wiring shall be shown on the control shop drawings.

E. A complete written Sequence of Operation and input/output points list of all points connected to the DDC system shall be included for each piece of controlled equipment. This information shall be located on the associated system control shop drawing or on the page immediately following if the information will not fit on the system drawing.

F. Label control shop drawings and title blocks descriptive of controlled equipment shown on the shop drawing. Do not label shop drawings to match mechanical drawing numbers.

G. Clearly reference covered specification and drawing on each submittal. Product submittals shall consist of a complete list of equipment and materials, including manufacturer's catalog data sheets and installation instructions. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate specific data for the product being submitted by highlighting or by other means. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work.

H. Product submittals shall include manufacturer's product data and specifications for any Operator Workstation; Web browser user interface server or workstation and software; portable operator's terminal; uninterruptible power supply; printer; and networking equipment provided as part of the EMS.

I. Submittal shall include a system schematic riser diagram depicting the building OWS; printers; browser user interface computers / peripherals; Network Area Controllers (NAC); standalone EMS controllers, 3rd party controllers; and the networking equipment required to make a complete and functional system.

J. Upon completion of the work, provide three (3) hardcopy sets of Operation and Maintenance Manuals to the Owner's representative. The entire Operation and Maintenance Manual shall also be furnished on compact disk media. The manuals shall include the following for the EMS provided:

1. Table of contents.
2. As-built system record drawings. Computer Aided Drawings (AutoCAD 2006 or newer) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
3. As-built versions of manufacturers' product data sheets for all products including software.
4. System Operator's manuals with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
5. Licenses, guarantees and warranty documents for equipment and systems.
6. EMS network diagrams.
7. Wiring termination schedules.
8. Interfaces to all third-party products and work by other trades.
9. List of recommended spare parts with part numbers and suppliers.
10. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning and calibration; time between tasks; and task descriptions.

K. As-built software documentation shall be provided on a CD and include the following:

1. Descriptive point lists.
2. Application program listing.

3. Application programs with comments.
4. Printouts of all reports.
5. Alarm list.
6. Printouts of all graphics.

L. The Operation and Maintenance Manual CD shall be self-contained and include all necessary software required to access the project record drawings, data sheets, spare parts list and maintenance procedures. A logically organized table of contents shall provide dynamic links to view and print all project record drawings and product data sheets. Viewer software shall provide the ability to display, zoom and search all documents.

M. On-line Documentation: After completion of all the tests and adjustments listed above, the contractor shall install the following information on the EMS:

1. "AS-BUILT" drawing files
2. Detailed catalog data on all installed system components
3. Address and phone number of factory repair service contact

PART 2 PRODUCTS

2.1 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 ACCEPTABLE SUPPLIERS/MANUFACTURERS:

Automated Logic (Eastern Heating & Cooling)
Or Approved Equal

2.3 POWER FAIL / AUTO RESTART

A. Provide for the automatic orderly and predefined shutdown of parts of or the entire EMS following total loss of power to parts of or the entire EMS.

B. Provide for the automatic orderly and predefined startup of parts of or the entire EMS following re-establishing of power to parts of or the entire EMS.

C. Maintain the EMS real-time clock operation during periods of power outage for a minimum of 72 hours.

D. Refer to additional Power Fail / Auto Restart requirements in the Sequence of Operation section.

2.4 POWER SUPPLIES & POWER CONDITIONING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

B. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

C. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

D. Line voltage units shall be UL recognized and CSA listed.

E. All system controllers, with the exception of the room VAV box controllers, shall be provided with power conditioning, over-voltage **and** under-voltage protection. Under-voltage protection shall be provided by voltage sensing relays (refer to HVAC field devices) or an uninterruptible power supply sized appropriately by EMS contractor for its protected controllers.

2.5 HVAC FIELD DEVICES:

A. Motorized Control Dampers provided by EMS contractor unless otherwise noted. Refer to section 230910 for specifications.

B. Control Damper Actuators: Spring-return actuators installed for fail-safe action are required for all dampers. Unless otherwise specified in the Sequence of Operation or on the drawings, dampers utilized in outside, relief and exhaust air applications shall be fail-safe closed; dampers utilized in return air applications shall be fail-safe open; combustion air dampers and emergency generator intake and exhaust air dampers shall be fail-safe open. Actuators shall be electric/electronic sized to match the application with adequate power to operate smoothly and provide tight close-off. Two-position or proportional electric/electronic actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation. Actuators shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS). Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications.) 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring. Operators shall be able to manually position each actuator when the actuator is not powered. Spring-return actuators with more than 60 in.-lb torque capacity shall have a manual crank. Provide one actuator per damper section at a minimum. EMS contractor shall provide all damper actuators unless otherwise specified elsewhere. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor.

C. Control Valves: Spring-return, fail-open action is required for all heating and cooling coil control valves on any equipment that has an outside air source unless otherwise specified in the Sequence of Operation. Select body and trim materials in accordance with manufacturer's recommendations for design conditions and service shown. Water service control valves shall be 2-way or 3-way pattern as specified or shown on the drawings and shall provide tight shutoff against system design pressures and differentials (150% of total pump head for 2-way valves and 100% for 3-way valves). Two-position valves shall be "line" size. Proportional control valves for water service shall be sized for a maximum pressure drop of 3.0 psi at rated flow (except as may be noted on the drawings). Proportional control valves for steam service shall be sized as appropriate for the application and the inlet steam pressure. Valves providing modulating service shall have equal percentage ports. Valves with sizes up to and including 2 inches shall be "screwed" configuration and 2-1/2 inch and larger valves shall be "flanged" configuration. All actuators shall be sized for tight shut-off against system pressures and furnished with integral switches for indication of valve position (open-closed). Electric bi-directional actuators are acceptable on VAV terminal units and room reheat coil valve control. All electric actuators for applications other than VAV terminal units and room reheat coil valve control shall be proportional analog 4-20Ma or 0-10Vdc input. Three-way butterfly valves, when utilized, shall include a separate actuator for each butterfly segment. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor.

D. Wall Mount Room Temperature Sensors: Each room temperature sensor shall provide temperature indication to the digital controller and provide the capability for a software-limited set point adjustment and operation override capability. An integral LCD shall annunciate current room temperature and set point as well as override status indication. In addition, the sensor shall include a port for connection to a portable operatorss terminal. Sensors shall be mounted at 54 inches AFF unless indicated otherwise on drawings.

E. Duct Mount, Pipe Mount and Outside Air Temperature Sensors: 10,000-ohm thermistor temperature sensors with an accuracy of ∀ 0.2"C. or two wire RTD type with nickel wound elements with a minimum of 1000 ohm reference resistance and a minimum accuracy of +/- 0.5 deg F. Outside air sensors shall include an integral sun shield and be mounted on a northern exposure. Immersion sensors shall be provided with a separable brass or stainless steel well, as required by the application. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.

F. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

G. Power Monitoring Interface: The Power Monitoring Interface (PMI) device shall include the appropriate current and potential (voltage) transformers. The PMI shall be certified under UL-3111. The PMI shall perform continuous true RMS measurement based on 32 samples-per-cycle sampling on all voltage and current signals. The PMI shall provide outputs to the EMS based on the measurement and calculation of the following parameters: (a) current for each phase and average of all three phases, (b) kW for each phase and total of all three phases, (c) power factor for each phase and all three phases, (d) percent voltage unbalance and (e) percent current unbalance. These output values shall be hard-wired inputs to the EMS or shall be communicated to the EMS over the open-protocol LAN.

H. Water flow meters shall be single turbine insertion-type with frequency output complete with hot-tap isolation valves to enable sensor removal without water supply system shutdown. Accuracy shall be □ ± 0.5% of reading at calibrated velocity. Frequency output 0-15V peak pulse. Meters shall be fully compatible for use as a system with BTU meters as specified below. Flow meter shall be Onicon F-1100, or approved equal.

I. BTU meters shall come complete with temperature sensors and thermowells and be fully compatible for use as a system with water flow meters as specified above. Differential temperature accuracy shall be □ ± 0.15°F over calibrated range. Non-volatile EEPROM memory shall retain all program parameters and totalized values in the event of power loss. Alphanumeric LCD shall display total energy, total flow, energy rate, flow rate, supply temperature and return temperature. Standard output signal shall be isolated solid state dry contact for energy total. Provide with optional 4-20mA analog output for flow rate. BTU meter shall be Onicon System-10 BTU meter, or approved equal.

J. Temperature Control Panels: Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door, key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel. Pre-wire internal and face-mounted device connections with color-coded stranded conductors, tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring. Each local panel shall have a control power source power switch (on-off) with over-current protection. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels.

K. Filter differential pressure switches shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have adjustable scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified. Switches shall be piped across the filter sections and set per the filter manufacturer's recommendations.

L. Filter differential pressure sensing device shall be indicating transmitter type designed to provide both visual monitoring at the filter location and electronic monitoring at the EMS. Transmitter shall have easily-read dial gage and two-wire, 4-20mA control signal with rear-mounted terminal strip. Transmitter shall be Dwyer Magnehelic Differential Pressure Indicating Transmitter Model 605, or approved equal with range appropriate for filter bank and shall be piped across the filter sections. EMS alarm point shall be set per the filter manufacturer's recommendations.

M. Water flow switches: Flow-proving switches shall be differential pressure type. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum). Scale range and differential shall be suitable for intended application and NEMA 1 enclosure unless otherwise specified. Paddle-type flow switches are not acceptable.

N. Low limit air stream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Provide one thermostat for each 25 square foot of coil area. Low limit thermostat shall be manual reset and shall be double pole so as to provide input capability for alarm at the EMS.

O. High limit thermostats shall be located as directed and shall be manual reset type set at 120°F in the return and 180°F in the discharge. Thermostats shall be double pole so as to provide input capability for alarm at the EMS.

P. Humidity Sensors: Wall mount sensors shall have a minimum sensing range of 0%-95%. Duct mount sensors shall have a minimum sensing range of 20%-80%. Duct mount sensors shall have a sampling chamber. Outdoor air humidity sensors shall have a sensing range of 0%-100% RH and shall be suitable for ambient conditions of -40-60deg C (-40-140deg F). Wall and duct mount humidity sensors shall be Vaisala HMD/W60/70 Series Transmitters, or approved equal. Outdoor air mounted humidity sensors shall be Vaisala HMP60 probe with DTR500 shield, or approved equal. Wall mounted sensors shall be mounted at 54 inches AFF unless indicated otherwise on drawings.

Q. Air static differential pressure transmitters shall have an overpressure rating of up to 10psi depending on range. The transmitter shall have an accuracy of not less than +/- 1.0% full scale with an operating environment of 0 to 175 deg F. Output shall be a 4 20mA. Transmitters shall be Setra Model 264, or approved equal..

R. Liquid pressure transmitters shall be housed in a NEMA 4 enclosure with a burst pressure rating of 500% rated range and overpressure rating of 300% rated range. The transmitter shall have an accuracy of not less than +/- 1.0% full scale with an operating environment of 0 to 180°F and 10-90% RH Non-Condensing. Output shall be 4-20mA. Transmitters shall be Mamac PR-264, or approved equal.

S. Liquid differential pressure transmitters shall be housed in a NEMA 4 enclosure with a burst pressure rating of 500% rated range, overpressure rating of 300% rated range and maximum static pressure rating of 200% of differential pressure range. The transmitter shall have an accuracy of not less than +/- 1.0% full scale with an operating environment of 0 to 180°F and 10-90% RH Non-Condensing. Output shall be 4-20mA. Transmitters shall be Mamac PR-283, or approved equal.

T. Steam pressure measurements shall be accurate to +/- 0.13% of range using a solid-state sensing element. The range of the instrument selected shall be 2 times the operating pressure of the sensed variable. Unit shall be provided with isolation and bypass manifold for start-up and maintenance operations. Transmitter shall be Setra model C-207, or approved equal.

U. CO2 Sensors: CO2 sensors shall provide simultaneous analog outputs in volts and milliamps and shall have a gold bifurcated relay that can be operated as normally open or closed; sensor shall incorporate elevation correction adjustment and ABCLogic™ (Automatic Background Calibration) software for self-correction of drift to better than ±10ppm per year. Sensor shall have an accuracy of ±40 ppm or 3% of the reading (whichever is greater) @ 72°F. All adjustments to the sensor including output scaling, elevation adjustment, relay setpoint, relay dead-band, proportional or exponential output, and single-point calibration shall be made via computer connection to an on-board RJ45 jack. Sensor shall have a detachable base with all field wiring terminals on the base. Sensor shall suitable for wall, duct or outdoor sensing application as required. CO2 sensor shall be the GE Telaire 8001 non-dispersive infrared sensor, or approved equal. Wall mounted sensors shall be mounted at 54 inches AFF unless indicated otherwise on drawings.

V. Control relays shall be plug-in type or encapsulated, UL listed and with coil and contact ratings suitable for the application. Provide NEMA 1 enclosure for relays not installed in local control panel.

W. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

X. Damper blade position limit switch shall be Kele model LS45M91B11 Whisker Switch, or approved equal. Damper actuator switches are not acceptable. Devices which only sense damper shaft position are not acceptable.

Y. Door position switch shall be a hermetically sealed reed switch nominally 3" L x 1" H x 0.50" D with matching actuating magnet. Contact and magnets shall be in brushed anodized aluminum tube housing. Contact shall be sealed. Each contact shall connect to three feet of flex stainless steel conduit. Switches shall be GE Sentrol model 2505A, or approved equal.

Z. Condensate pan high level alarm switch shall be in inline, low voltage condensate overflow shutoff pre-wired with 4-foot, 18 AWG wires. Switch shall be RectorSeal Safe-T-Switch SS1, or approved equal.

AA. Area surface moisture detection system shall be 12V or 24V AC or DC hardwire-powered with up to six surface sensor probes; form C (SPDT) 1 Amp @ 24VAC, 1 Amp @ 30VDC output; 32 to 140°F operating temperature; high humidity or condensation conditions will not cause alarm. System shall be Winland Electronics WaterBug WB-200 with W-S-U surface sensor, or approved equal.

BB. Voltage sensing relays shall be capable of monitoring and reacting to over and under voltage conditions. Adjustable upper and lower voltage trip-points, LED indication of both presence of input voltage and when output is energized and adjustable transfer-of-contacts timing delay. Relay shall be Magnecraft 831VS-120, or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate this section's work with work of others. EMS Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.2 PROTECTION

A. EMS Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. EMS Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance

1. Provide Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing.

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing the first five (5) terminal units.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

3.4 INSTALLATION

A. General Notes:

1. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

2. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

3. Install specified temperature control equipment in Mechanical Equipment and Machine Rooms, and Penthouse Mechanical Equipment rooms in local control panels. Refer to Article entitled "Local Control Panels".

4. Install and properly support all ductstats, dial thermometers, thermostat bulbs, temperature and humidity sensors and controllers, etc., in the center of duct cross section, in a straight duct run.

5. Provide averaging type elements for sensing mixed air temperatures in ductwork, with sufficient length or sufficient number of elements, so as to efficiently measure the air temperature through the entire cross section of duct.

6. Test all electric and electronic equipment provided under this Section.

B. Provide DDC/electric-electronic control system, as noted on the drawings and as specified. Provide all necessary relays, mounting brackets, gages, switches and accessories required, even though not specifically called for, so as to result in complete workable systems.

C. All work described in this section shall be installed, wired, circuit-tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the temperature control system manufacturer or its exclusive factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of the local exclusive factory authorized temperature control contracting field office (branch or representative).

D. Install system and materials in accordance with manufacturer□s instructions, and as detailed on the project drawing set.

E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the EMS contractor.

F. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.5 WIRING

A. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 26, and manufacturer's recommendations.

B. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor unless shown otherwise on electrical drawings.

C. Line voltage wiring to EMS controllers and equipment panels is considered control wiring and shall be provided by the EMS contractor unless shown otherwise on electrical drawings.

D. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 26.

E. Low-voltage wiring shall meet NEC Class 2 requirements. Sub-fuse low-voltage power circuits as required to meet Class 2 current limit.

F. NEC Class 2 (current-limited) wires not in raceway shall be plenum-rated and UL listed for the intended application.

G. Install wiring in raceway where subject to mechanical damage and at levels below 10ft in mechanical, electrical, or service rooms.

H. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

I. Do not install wiring in raceway containing tubing.

J. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 10 ft intervals.

K. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

L. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

M. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.

N. Include one pull string in each raceway 1 in. or larger.

O. Use color-coded conductors throughout.

P. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

Q. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 6 in. between raceway and high-temperature equipment such as steam pipes or flues.

R. Adhere to requirements in Division 26 where raceway crosses building expansion joints.

S. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

T. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

U. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 3 ft in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

V. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

3.6 COMMUNICATION WIRING

A. Communication wiring shall be low-voltage Class 2 wiring.

B. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

C. Communication wires not in raceway but in concealed and accessible locations such as return air plenums shall be plenum-rated and UL listed for the intended application.

D. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

E. Verify entire network's integrity following cable installation using appropriate tests for each cable.

F. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

G. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

H. Label communication wiring to indicate origination and destination.

I. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.7 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

E. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 1 ft. of sensing element for each square foot of coil area. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the coil.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Install outdoor air temperature sensors on north wall at designated location with sun shield.

I. Differential Air Static Pressure

1. Supply Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

2. Return Duct Static Pressure. Pipe pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building sensing the average atmospheric pressure at four points (North, South, East and West). Pipe high-pressure port to a location behind a thermostat cover. Provide all necessary filtering, surge dampeners, atmospheric and room static pressure sensing heads, etc., required for accurate and stable building pressurization control.

4. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

5. Pressure transducers, except those controlling VAV boxes, shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

6. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

J. Low limit thermostats, high limit thermostats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.8 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.

2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten linkage.

3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer. Low voltage and line voltage wiring to actuators is considered control wiring and shall be provided by the EMS contractor.

3.9 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 2 in. of termination.

B. Label pneumatic tubing at each end within 2 in. of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show instrument or item served.

D. Label control panels with minimum ½ in. letters on laminated plastic nameplates.

E. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

F. Label room sensors related to terminal boxes or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

H. Label identifiers shall match record documents.

3.10 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of final system acceptance. Control system failures during warranty period shall be adjusted, repaired or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner’s warranty service request.

B. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

C. Provide updates to operator workstation, web server software, project-specific software, graphic software, database software, and firmware at no charge to the Owner during the warranty period. Do not install updates or upgrades without Owner’s prior authorization.

3.11 WARRANTY ACCESS

A. The Owner shall grant to the EMS contractor reasonable access to the EMS during the warranty period. The owner shall allow the contractor to access the EMS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.12 ACCEPTANCE TESTING

A. Upon completion of the installation, the EMS contractor shall load all system software and start-up the system. The EMS contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. The EMS contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: Satisfactory completion is when the EMS contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner□s Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.13 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:

1. Graphics

2. Record drawings

3. Database

4. Application programming code

5. Documentation

3.14 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

3.15 OPERATOR INSTRUCTION AND TRAINING

A. Provide training for a designated staff of Owner's representatives. Training shall be eight (8) hours in duration. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, on-site training, or a combination of training methods.

B. Training shall be tailored to the Owner's existing EMS and specific controlled equipment and systems of this project.

3.16 FIELD QUALITY CONTROL

A. Provide the services of a qualified engineer, in the employ of the control systems manufacturer, for the initial start-up and calibration of control systems, and the instruction of Owner's Personnel.

3.17 SOFTWARE INSTALLATION

A. General: The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

B. Database Configuration: The Contractor shall provide all labor to configure those portions of the database that are required by the point list and sequence of operation.

C. Color Graphic Slides: Unless otherwise directed by the owner, the Contractor shall provide color graphic displays as depicted in the schematic drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.

3.18 COMMISSIONING AND SYSTEM STARTUP

A. Point to Point Checkout: Each I/O device (both field mounted and those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the Engineer.

B. Controller Checkout: A field checkout of all controllers shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the Engineer by the completion of the project.

C. System Acceptance Testing:

1. All application software shall be verified and compared against the sequences of operation. Control loops shall be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.

2. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the Engineer.

3. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the Engineer.

4. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

END OF SECTION 230923

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Direct Digital Control System 230923

1.2 SUMMARY

A. This section includes control sequences for HVAC equipment.

B. Related section 230923- "Direct Digital Control System" contains requirements that relate to this Section.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 SEQUENCE OF OPERATION

3.1 GENERAL

A. For each system listed provide direct digital control for the sequence of operation as stated in this section.

B. Power Fail/Auto Restart

1. Upon the restoration of power following a power loss, the EMS shall analyze the status of all controlled equipment, compare it with normal programmed scheduling and turn equipment on or off as necessary to resume normal operations.

2. The EMS shall provide an orderly, staggered and predefined scheduling of return-to-normal operation of controlled equipment. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable.

C. Fire Alarm Shut Down: In an alarm condition, the Fire Alarm system shall shut down fans through direct interlock. The EMS shall not shut down the fans. The EMS contractor shall ensure that dampers and valves position to their fail-safe positions.

D. All suggested setpoints and settings shall be adjustable.

E. Provide temperature sensors installed under flush mounted protective plates in male toilet room. Provide metal protective guards on all room temperature sensors and thermostats located in mechanical equipment room, water room, electric room, ATS room,maintenance workshopshipping and receiving areas, etc.

F. For all analog measurements provide high and low limit and fault alarm indication. For all fans, pumps, etc., provide status alarm indication.

G. Provide indication of system modes: i.e., Occupied, Unoccupied, Warmup, Cooldown, Pre-Occupancy Purge, Post Occupancy Flush, etc. Differentiate as appropriate for all systems controlled or interfaced to.

H. All analog, binary and time variables and point information and adjustments shall be accessible via the OWS, web browser, etc.

I. All adjustment and acknowledgment permissions shall be password-level dependent.

3.2 GEOTHERMAL HEATING/COOLING SYSTEM

A. Building Glycol Water Pumps (P-1/P-1A)

1. The system shall be manually enabled for continuous operation through the EMS. The EMS shall initially start the primary pump on minimum speed. The EMS shall sense the loop supply and return differential pressure at a remote point in the system and modulate the pump VFD to maintain the adjustable system differential set point.

2. The EMS shall modulate the 2-way bypass valve to maintain the loop supply and return differential pressure when the VFD has reached minimum speed and there is a rise in the differential pressure above the set point. The VFD shall not increase its speed until the 2-way bypass valve has fully shut and the differential pressure has dropped below the set point.

3. The EMS shall use current sensors to confirm the pumps are in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command. If pump operation is not verified the standby pump shall be automatically started and an alarm indicated.

4. The primary pump shall rotate on a weekly basis at 6:00 AM on Tuesdays.

B. Bore Field Glycol Water Pumps (P-2/P-2A)

1. The EMS shall sense the building heat pump loop return water temperature. As the temperature drops below the low limit set point of 45°F the EMS shall start the lead operating pump on minimum speed and slowly modulate the pump VFD as necessary to increase the loop temperature 2°F above the set point. The EMS shall then stop the pump. As the loop temperature increases above the high limit set point of 80°F the EMS shall start the lead operating pump on minimum speed and slowly modulate the pump VFD as necessary to decrease the loop temperature 2°F below the set point. The EMS shall then stop the pump.

2. The EMS system shall use current sensors to confirm the pumps are in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command. If pump operation is not verified the standby pump shall be automatically started.

3. The lead and standby pump shall be rotated on a weekly basis.

C. Point List

1. Building loop pump P-1 VFD start/stop command
2. Building loop pump P-1 status
3. Building loop pump P-1 VFD speed command
4. Building loop pump P-1 alarm
5. Building loop pump P-1A VFD start/stop command
6. Building loop pump P-1A status
7. Building loop pump P-1A VFD speed command
8. Building loop pump P-1A alarm
9. Bore field loop pump P-2 VFD start/stop command
10. Bore field loop pump P-2 status
11. Bore field loop pump P-2 VFD speed command
12. Bore field loop pump P-2 alarm
13. Bore field loop pump P-2A VFD start/stop command
14. Bore field loop pump P-2A status
15. Bore field loop pump P-2A VFD speed command
16. Bore field loop pump P-2A alarm
17. Building loop HPWS temperature
18. Building loop HPWR temperature
19. Bore field loop HPWS temperature
20. Bore field loop HPWR temperature
21. Building loop flow (GPM)
22. Building loop bypass valve position command
23. Building loop valve position feedback
24. Building loop system differential pressure

3.3 WATER TO WATER HEAT PUMPS

A. Water to water heat pumps shall operate continuously 24/7/ 365 days a year through the EMS in either the heating or cooling mode and be rotated weekly for equal run time. Heating and cooling shall not operate simultaneously. WHP-1/1A and WHP-2/2A are 100% redundant with one of the two pairs in stanby mode. The source side end of cycle valve shall be closed when in stand-by mode and out of it's heating/ cooling mode.

B. Load side Glycol Water Pumps (P-3/P-3A) heating

1. The pumps shall be manually enabled for continuous operation through the EMS. The EMS shall start the primary pump and operate the pump at it's scheduled flow. Refer to the ERV control sequence for the heating operation.

2. The EMS shall use current sensors to confirm the pumps are in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command. If pump operation is not verified the standby pump shall be automatically started and an alarm indicated.

C. Load side Glycol Water Pumps (P-4/P-4A) cooling

1. The pumps shall be manually enabled for continuous operation through the EMS. The EMS shall start the primary pump and operate the pump at it's scheduled flow. Refer to the ERV control sequence for the cooling operation.

2. The EMS shall use current sensors to confirm the pumps are in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command. If pump operation is not verified the standby pump shall be automatically started and an alarm indicated

D. Water to water heat pump status and alarms shall be monitored at the operator's workstation.

E. Point List

1. WHP-1 start/stop
2. WHP-1 status
3. WHP-1A start/stop
4. WHP-1A status
5. WHP-2 start/stop
6. WHP-2 status
7. WHP-2A start/stop
8. WHP-2A status
9. WHP-1/1A Heating setpoint
10. WHP-1/1A load side leaving water temperature
11. WHP-2/2A Cooling setpoint
12. WHP-2/2A load side leaving water temperature
13. WHP-1/1A source side end of cycle valve
14. WHP-2/2A source side end of cycle valve
15. Pump P-3/P-3A start/ stop
16. Pump P-3/P-3A status
17. Pump P-3/P-3A speed
18. Pump P-4/P-4A start/ stop

19. Pump P-4/P-4A status
20. Pump P-4/P-4A speed

3.4 ENERGY RECOVERY VENTILATOR

A. General

1. The energy recovery unit (ERV) shall be started / stopped by the EMS system based on a occupancy schedule. If the supply air fan and exhaust air fan is not in operation the outside air and relief dampers shall remain closed.
2. Only one ERV shall operate at any given time. The lead ERV and stand-by ERV shall rotate on a weekly basis.
3. Should the lead ERV fail in any mode of operation, this unit shall be stopped. The stand-by ERV shall be enabled and alarm generated indicating the failure.

B. Occupied mode:

1. In occupied mode, the outside air and relief air dampers shall be fully open and fans shall run continuously. End switches shall prove the position of the outdoor air and relief air dampers. The ERV shall maintain supply air temperature as indicated below.
2. The supply and return fans shall operate to maintain the same supply and return CFM as controlled by the supply and return airflow measuring stations and unit VFD/ ECM controls.
3. Occupancy schedule:

MON-SUN
24/7/ 365 days

C. Ventilation mode:

1. Whenever during occupied time there is no demand for heating, cooling, or dehumidification the unit fans shall run, outside and relief damper shall open. Discharge temperature shall be set between 60-70°F.

D. Dehumidification mode:

1. Upon a rise in supply air relative humidity above setpoint (60%), or outdoor dew point is above 50°F and unit is not in cooling mode already. The discharge air temperature shall be 55°F and modulate the cooling coil to maintain supply air dry bulb temperature while reducing supply air humidity.

E. Defrost cycle:

1. The heat will be active any time the unit is running. The heat wheel defrost cycle will occur if relief air temp is 10°F within the outside air temperature and 30 minutes have passed since the last defrost cycle. The defrost cycle will turn the heat wheel off for two minutes relief fan shall run.

F. Heating mode discharge:

1. Upon a fall in supply air temperature below 60°F The glycol heating coil three-way valve shall modulate to maintain supply air temperature setpoint of 68°F.

G. Mechanical cooling:

1. Upon a rise in supply air temperature above 75°F the glycol cooling coil three-way valve shall modulate to maintain supply air temperature of 70°F.

H. Safeties, Alarms, and Monitoring:

1. When the differential pressure switch indicates a dirty filter, an alarm hall be sent to the BAS system. Coordinate setpoint wit rooftop unit manufacturer and MERV rating of filter.

2. Upon sensing the presense of smoke, the supply duct/ relief duct smoke detector(s) shall shut down the unit, send an alarm signal the fire system, close the outside air damper, and generate an alarm at the operator's workstation. Manual reset is required.

3. Generate an alarm at the operator's workstation if the ventilation rate measured at the airflow measuring stations fall below 90% or rises above 110% of the minimum schedule value.

4. High/Low Limits: Upon a fall in supply air temperature below 45°F or a rise above 105°F the unit shall shut down and an alarm shall be generated at the operator' workstation.

5. High CO2 Alarm: Upon a rise in carbon dioxide level at either sensor 700 PPM above outdoor CO2 levels an alarm shall be generated at the operator's workstation.

6. High Duct Static Alarm: Upon a rise in duct static pressure, 0.5" WG above scheduled external static pressure for the unit, the unit shall shut down and generate an alarm at the operator's workstation.

7. A float switch in the cooling coil drain pan shall shut down the unit and generate and alarm at the operator's workstation upon detecting high water level.

8. Manual emergency EPO switch inside the mechaical room door shall shutdown ERV-1/ ERV-1A when activated. The outdoor air and relief air dampers shall close when switch is activated.

I. Interface requirements for energy management system (EMS):

1. Provide BACnet compatible interface with ERV manufacturer's control panel for EMS central HVAC control system for the following:

a. Monitoring unit provided points.

J. Point List

1. Outdoor air damper command

2. Outdoor air damper end switch

3. Relief air damper command

4. Relief air damper end switch

5. ERV-1 command

6. ERV-1A command

7. ERV-1 start/ stop
8. ERV-1A start/ stop
9. ERV-1 status
10. ERV-1A status
11. ERV-1 supply fan speed
12. ERV-1 return fan speed
13. ERV-1A supply fan speed
14. ERV-1A return fan speed
15. ERV-1 filter differential pressure
16. ERV-1A filter differential pressure
17. Supply air temperature
18. Duct static pressure
19. Outdoor air temperature
20. Outdoor air relative humidity
21. Supply air relative humidity
22. ERV-1 cooling end of cycle valve
23. ERV-1 heating end of cycle valve
24. ERV-1A cooling end of cycle valve
25. ERV-1A heating end of cycle valve
26. ERV-1 three-way heating coil valve
27. ERV-1 three-way cooling coil valve
28. ERV-1A three-way heating coil valve
29. ERV-1A three-way cooling coil valve
30. Air flow measuring station supply air CFM
31. Air flow measuring station relief air CFM
32. High static alarm
33. Duct smoke alarms (typical)

3.5 SERVER ROOM AIR CONDITIONING UNITS AC-1/AC-1 AND ACCU-1/ACCU-1A

A. Units shall operate under the factory ICOM microprocessor control system. Units are 100% redundant and shall rotate operation for equal run time.

B. All unit factory control points, alarms and custom alarms shall be communicated to the EMS. Refer to specification section 238124.

C. Racks internal temperature shall be monitored by the server room air conditioning units and be communicated to the EMS.

3.6 PSAP AND GOC VAV BOXES CONTROLS - VAV BOX (TYPICAL 2)

A. VAV terminal boxes shall perform airflow tracking and demand-controlled ventilation CO2 control. Refer to the VAV box schedule for all actual maximum occupied CFM and minimum occupied CFM values.

B. The VAV supply air box is pressure independent and adjusts damper position in response to space CO2 changes.

C. Occupied: The VAV box damper shall be modulated to the minimum airflow position.

D. As the CO2 level rises to 100 ppm greater than the outside air CO2 the VAV box damper shall modulate its damper open from its minimum CFM to the maximum CFM. When the space CO2 level is within 100 ppm of the outside air CO2 the VAV box damper shall modulate as necessary to maintain the minimum CFM.

E. Point List (Typical 2)

1. Space CO2 level
2. Outdoor CO2 level
3. VAV damper command
4. VAV airflow (CFM)

3.7 PSAP AND GOC HEAT PUMPS (TYPICAL OF HP-10, 11 & 12 AND HP-17, 18 & 19 RESPECTFULLY)

A. Heat pump shall be provided with factory mounted DDC controller and space temperature and humidity sensors.

B. The three heat pumps serving the two spaces are sized at 50% capacity to allow for one unit to be shutdown and still have the capacity for the two spaces. The three units serving the two spaces shall be rotated for equal run time. The motorized isolation valve shall be closed whenever the heat pump is rotated to the standby mode.

C. Occupancy schedule and occupied and unoccupied temperature and humidity setpoints shall be adjustable from operator's workstation.

D. Heat pump shall automatically index between heating, cooling, and dehumidification modes. Flow switch shall provide proof of flow prior to starting compressor. Generate an alarm if the flow switch does note detect flow when the system commanded to run. Each pair of operating heat pumps shall run in the same mode and be controlled in parallel.

E. During occupied mode the supply fan shall run continuously. During unoccupied mode the supply fan shall cycle on and off to maintain space temperature at setpoint.

F. When space relative humidity rises above the setpoint, the unit shall index to dehumidification mode and the hot gas reheat coil shall modulate to maintain space temperature and humidity

G. Upon sensing liquid in the auxiliary drain pan the heat pump shall shut down and a high priority alarm shall be generated at the operator's workstation.

H. Supply and return temperature shall be monitored at the operator's workstation.

I. Provide a differential pressure senor across the filters, either provided with the heat pump if applicable or field installed. Coordinate dirty filter alarm setpoint with manufacturer.

J. Heat pump status and alarms shall be monitored at the operator's workstation via BacNet interface.

K. Point List

1. Supply fan start/stop
2. Supply fan status
3. Space temperature
4. Heating set point
5. Cooling set point
6. Supply air temperature
7. Leaving Water Temperature
8. Return air temperature
9. Dirty filter interval
10. Refer to specification 238146 for additional available points to be monitored at the operator's workstation.

3.8 HEAT PUMPS

A. Heat pump shall be provided with factory mounted DDC controller and space temperature and humidity sensors.

B. Occupancy schedule and occupied and unoccupied temperature and humidity setpoints shall be adjustable from operator's workstation.

C. Heat pump shall automatically index between heating, cooling, and dehumidification modes. Flow switch shall provide proof of flow prior to starting compressor. Generate an alarm if the flow switch does note detect flow when the system commanded to run.

D. During occupied mode the supply fan shall run continuously. During unoccupied mode the supply fan shall cycle on and off to maintain space temperature at setpoint.

E. When space relative humidity rises above the setpoint, the unit shall index to dehumidification mode and the hot gas reheat coil shall modulate to maintain space temperature and humidity

F. Upon sensing liquid in the auxiliary drain pan the heat pump shall shut down and a high priority alarm shall be generated at the operator's workstation.

G. Supply and return temperature shall be monitored at the operator's workstation.

H. Provide a differential pressure senor across the filters, either provided with the heat pump if applicable or field installed. Coordinate dirty filter alarm setpoint with manufacturer.

I. Heat pump status and alarms shall be monitored at the operator's workstation.

J. Point List

1. Supply fan start/stop
2. Supply fan status
3. Space temperature
4. Heating set point
5. Cooling set point
6. Supply air temperature
7. Leaving Water Temperature
8. Return air temperature
9. Dirty filter interval

3.9 UNIT HEATER CONTROL (TYPICAL)

A. The EMS shall energize the electric coil and cycle the fan as necessary to maintain the 68°F space temperature set point.

B. Point List (Typical)

1. Space temperature
2. Fan start/stop command

3.10 CABINET UNIT HEATER CONTROL (TYPICAL)

A. The EMS shall energize the electric coil and cycle the fan as necessary to maintain the 68°F space temperature set point.

B. Point List (Typical)

1. Space temperature
2. Fan start/stop command

3.11 EXHAUST FAN

A. The exhaust fan shall run intermittently as space temperature rises above 85°F (ADJ.). Once the fan is indexed to start, the damper shall open, once proven open via damper end switch., the exhaust fan shall start.

B. The EMS shall use a current sensor to confirm the fan is in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command.

C. Point List

1. Fan start/stop command
2. Fan status
3. Space temperature
4. Damper command
5. Damper end switch

END OF SECTION 230993

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 232000

HVAC PIPING

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.

B. All work under this title, on drawings or specified, is subject to the architectural general and special contract conditions for the entire project, and the contractor for this portion of the work is required to refer especially thereto, and to the architectural drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Earthwork: Section 02200
Sealants: Section 07900
Common Work Results for HVAC: Section 230500
Cutting and Patching: Section 230503
Valves: Section 230523
Cleaning and Testing: 230593
Piping and Equipment Insulation: Section 230719
Direct Digital Control for HVAC: 230923

1.3 SUBMITTALS

A. Product Data: Manufacturer's name and the schedule, type of class of all pipe and fittings.

1. Where optional materials are specified in the "Pipe and Fitting Schedule", provide a pipe schedule to indicate the options selected; including piped systems, pipe material and break down of pipe sizes.

B. Quality Control Submittals

1. Installers Qualification Data

a. Welder Qualification Data: Copies of certification; including names and previous project experience of welders.

b. Brazer Qualification Date for Refrigerant Piping: State refrigerant piping brazing experience; including names and list of previous project experience of brazers.

1.4 QUALITY ASSURANCE

A. Qualifications of Welding Procedures, Welders and Welding Operators: Comply with the following:

1. Section IX ASME Boiler and Pressure Vessel Code, Part QW Welding.

2. American Welding Society Standard AWS D10.9, AR-3

B. Qualifications of Brazers: Comply with the following:

1. Section IX ASME Boiler and Pressure Vessel Code, Part QB Brazing.

2. Certification of brazing operator by recognized authorities which require a qualification test.

3. Refrigerant Piping: The persons performing the brazing and their supervisors shall be personally experienced in refrigerant piping brazing procedures.

PART 2 PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Standard Weight Schedule 40 or Extra Heavy Weight Schedule 80 Pipe, black or galvanized: ASTM A 53, ASTM A 106 or ASTM A 135.

B. Flanges, Welding Neck Type, Same Pressure Rating as Adjoining Pipe: ASME B16.5.

C. Welding Fittings, Carbon Steel:

1. Butt Welding Type: ASME B16.9

a. Allied Piping Products Co., Inc.'s Branchlets, Type 1 or 2

b. Bonney Forge Corp's Weldolets

2. Socket Welding Type: ASME B16.11

a. Allied Piping Products Co., Inc.'s Branchlets, Type 1 or 2

b. Bonney Forge Corp's Threadolets or Sockolets

D. Compact Design Weld Fittings: Landish Co.'s LP, Nibco Inc's Husky, Taylor Forge Inc.'s Compact Line, Tube Turns Inc.'s Econo.

E. Malleable Iron, Steam Pattern Threaded Fittings

1. 150 lb. Class: ASME B16.3

2. 300 lb. Class: ASME B16.3

F. Cast Iron Fittings

1. Drainage Pattern, Threaded: ASME B16.12

2. Steam Pattern, Threaded: ASME B16.4

a. Standard Weight: Class 125

b. Extra Heavy Weight: Class 250

3. Flanged Fittings and Threaded Flanges: ASME B16.1

a. Standard Weight: Class 125

b. Extra Heavy Weight: Class 250

G. Unions: Rated 250 psi at 210 degrees F; ASME B16.39

H. Unions: Rated 250 psi at 275 degrees F; ASME B16.39

I. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.

J. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.2 COPPER TUBING AND FITTINGS

A. Water Tube, Types K, L, and M: ASTM B 88

B. Wrot Copper Water Tube Fittings, Solder Joint: ASME B16.22

C. Refrigerant Tube, Dry Sealed, Soft Annealed: ASTM B 280

D. Flared Tube Fittings:

1. Water Tube Type: ASME B16.26

2. Automotive Tube Type: SAE J512

3. Refrigerant Tube Type: SAE J513

E. Flanges: Conform to the Standards for fittings used in systems.

1. Brazing Flanges: ASME B16.24, hubs modified for brazing ends.

F. Unions: Cast bronze, 150 lb. Class, bronze-to-bronze seats, threaded or solder joint.

2.3 GROOVED PIPING SYSTEM

A. Grooved piping system as manufactured by Victaulic Co., Grinnell by Tyco, Gruvlok by ANVIL or acceptable manufacturer.

B. Pipe:

1. Standard Weight Schedule 40 or Extra Heavy Weight Schedule 80 Pipe, black or galvanized: ASTM A 53, ASTM A 106 or ASTM A 135.

2. Cut grooved end piping is not acceptable.

3. Couplings: Victaulic Co.'s flexible type Style 77 and W77,-having pressure rating of:

a. 1000 psi for 3/4 inch to 6 inch

b. 800 psi for 8 inch to 12 inch

c. 350 psi for 14 inch to 24 inch

C. Couplings and Fittings for Grooved End Pipe

1. Grooved-End-Tube Couplings: Rigid pattern gasketed fitting. Ductile-iron housing cast with offsetting, angle-pattern bolt pads to provide visual confirmation of joint integrity upon metal-to-metal pad contact. Tongue and recess rigid type couplings may only be used if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer's latest recommendations and each coupling shall be tagged indicating the specific value of torque attained to confirm joint rigidity and proper installation. Synthetic EPDM gasket similar to Grade EHP rated for maximum 250 deg F or Grade E EPDM rated to maximum of 230 deg F for use with housing, and steel bolts and nuts. Couplings shall be manufactured to connect copper tubing sized tube and fittings.

2. Couplings: Victaulic co.'s Zero-Flex Style 07 and 107H, having minimum pressure rating of:

   a. Style 107H or Style 07

      1) 750psi from 2 inch to 5 inch

      2) 700psi for 6 inch

      3) 600psi for 8 inch

      4) 500psi for 10 inch (07 only)

      5) 400psi for 12 inch (07 only)

   b. Style W07: 350 psi.

3. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:

   a. Steel: ASTM A53 or A106, Grade B

   b. Wrought Steel: ASTM A234, Grade WPB

   c. Ductile Iron: ASTM A536

4. Gaskets for Use with Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

5. Flange Adapter: Flat face, ductile iron housings with elastomeric pressure responsive gasket, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 741/W741.

6. Pipe Joint Make-up:

   a. Grooved Pipe Joint. Make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions. Pipe grooving shall be rolled in accordance with joint manufacturer's specifications. Lubricate gasket exterior including lips, pipe ends and housing interiors to prevent pinching the gasket during installation. Lubricant shall be as recommended by coupling manufacturer.

2.4 JOINING AND SEALANT MATERIALS

A. Thread Sealant

1. Lake Chemical Co.'s, Slic-Tite.

2. Loctite Corp's pipe sealant with Teflon.

B. Solder: Solid wire type conforming to the following:

1. Lead-free tin-Silver solder (ASTM B 32 Alloy Grade Sn 96): All-State Welding Products Inc.'s 430, J. W. Harris Co. Inc's Stay-Brite or Engelhard Corp's Silvabrite.

C. Soldering Flux for Soldered Joints

1. Solder: All-State Welding Products Inc.'s Duzall; J. W. Harris Co. Inc.'s Stay-Clean; Engelhard Corp's General Purpose Liquid or Paste.

D. Brazing Alloys

1. AWS A5.8, Class BCuP-5, for brazing copper to brass, bronze, or copper; Englehard's Silvaloy 15; J. W. Harris Co.Inc.'s Stay-Silv 56; and Handy & Harman's Braze 560.

2. AWS A5.8, Class BAg-7, for brazing copper to steel or stainless steel; Englehard's Silvaloy 56-T; J. W. Harris Co.Inc.'s Safety-Silv 56; and Handy & Harman's Braze 560.

E. Brazing Flux: FS O-F-499, Type B; Handy & Harman's Handy Flux or J. W. Harris Co. Inc.'s Stay-Silv.

F. Electrodes and Welding Rods

1. Electrodes for use in Arc Welding: Heavily coated, not larger then 3/16 inch diameter exclusive of coating, unless otherwise acceptable.

2. Welding Rods: Free flowing when fused, so as to avoid excessive puddling.

3. Electrodes for Welding Stainless Steels: Coated and used with reverse polarity

4. Filler material shall conform to the appropriate AWS-ASTM specification.

G. Flange Gasket Material

1. For Use with Cold Water or Chilled Water: 1/16 inch thick rubber and chemical compatibility with the system fluid.

2. For Use with Hot Water, Air or Steam: Waterproofed non-asbestos mineral or ceramic fiber, or a combination of metal and waterproofed non-asbestos mineral or ceramic fiber, designed for the temperature and pressures of the piping systems in which installed and chemical compatibility with the system fluid.

H. Anti-Seize Lubricant: Bostick Inc.'s Never Seez or Dow Corning Corp's Molykote 1000.

2.5 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

A. Oakum: FA A-A-1186

B. Mechanical Modular Seals: Thunderline Corp's Link Seal wall and floor seals designed for the service of piping system in which installed.

2.6 DIELECTRIC CONNECTORS

A. Brass nipples, couplings, fittings, valves or combinations of are not considered a dielectric connection and shall not be an acceptable assembly for such.

B. Dielectric waterway fittings with an inert, non-corrosive thermoplastic lining (NSF/FDA listed). Manufacturer: Grinnell, GruvLok or Victaulic Co.

C. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers and dielectric gasket.

1. Rated 250 psi at 210 degrees F.

2. Rated 250 psi at 275 degrees F.

D. Flange Unions: Rated 175 psi at 210 degrees F; ASTM B16.42 (iron) and ASTM B16.24 (bronze).

2.7 PIPE SLEEVES

A. Type A: Schedule 40 steel pipe.

B. Type B: No. 16 gauge galvanized sheet steel.

C. Type C: Schedule 40 steel pipe and 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collard as required to span a minimum of one cell or corrugation, on all sided of the rough opening thru the metal deck.

D. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collard as required to span a minimum of one cell or corrugation on all sides of the rough opening thru the metal deck.

2.8 FLOOR, WALL AND CEILING PLATES

A. Cast Brass: Polished chrome plated finish, with set screw.

1. Solid Type: Models 5 and 5T by Pegasus Manufacturing Inc., Cheshire, CT; and Models 951 – 960 (inclusive) by Bridgeport Plumbing Products, Moultrie, GA.

2. Split Type: Models 3 and 3T by Pegasus Manufacturing Inc., Cheshire, CT.

B. Cast Iron: Solid type, unplated, with set screw. Model 395 by Grinnell Corp., Cranston, RI.

PART 3 EXECUTION

3.1 INSTALLATION – GENERAL

A. The drawings show the general arrangement of pipe equipment but do not show all required fittings and offsets that may be required. Provide all necessary fittings, offsets and pipe runs based on field measurements.

B. Provide dielectric connections whenever connecting dissimilar materials.

C. Install vertical piping plumb and piping generally parallel to walls and column center lines, unless shown otherwise on the drawings. Space piping, including insulation, to provide one inch minimum clearance between adjacent piping or other surface. Unless shown otherwise, slope steam, condensate and drain piping down in the direction of flow not less than 25 mm (one inch) in 12 m (40 feet). Provide eccentric reducers to keep bottom of sloped piping flat.

D. Install piping clear of door swings and above sash heads.

E. Make allowances for expansion and contraction.

F. Use fittings for offsets and direction changes, except for Type K soft temper water tube.

G. Cut pipe and tubing ends square: ream before joining.

H. Threading: Use American Standard taper pipe thread dies.

1. Thread brass pipe with special brass threading dies.

I. Make final connections to equipment with unions, flanges, or mechanical type joint couplings.

J. Provide taps and install wells in piping for EMS/control system sensors and flow measurement devices.

3.2 PROPYLENE GLYCOL PIPING SYSTEMS

A. Pitch

1. Pitch horizontal piping 1/8 inch per 10 ft. in direction indicated on drawings. When direction of flow is not indicated, pitch supply piping up in direction of flow and return piping downward indirection of flow.

2. Pitch single pipe systems up in direction of flow 1/8 inch per 10 ft.

B. Air Vents: Install air vents at locations indicated on the drawings and at each high point in system. Use manually operated air vents, unless otherwise indicated.

C. Drains

1. Install piping to be completely drainable. Provide drains at low points, consisting of a 1/2 inch Drain Valve (Apollo #78-200) and at the following locations and equipment:

a. In each section of piping separated by valves.

b. For each riser, where riser or runout to riser has a valve installed.

c. For each heating cooling unit, having valves in supply and return connections.

d. In low point of piping to each down fed convector or radiator.

D. Runouts: Connect runouts to upfeed risers to top of mains and runouts to downfeed riser to bottom of mains.

3.3 PIPE JOINT MAKE-UP

A. Threaded: Threads shall conform to ASME B1.20, joint compound shall be applied to male threads only and joints made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound, or red lead point for corrosion protection.

B. Soldered: Thoroughly clean tube end and inside of fitting with sandpaper or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.

C. Flange:

1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.

2. Provide a gasket for each joint.

a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.

b. Compressed, Control, and Instrument Air Pipe Gasket: Coat with a thin film of oil before making up joint.

3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

D. Brazed Joint: Thoroughly clean tube end and inside of fitting with sandpaper or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to brazing temperature, and join the metals with brazing alloy. Remove residue.

E. Dissimilar Pipe Joints

1. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.

2. Joining Dissimilar Non-threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.

3. Joining Steel pipe, Brass or Copper Tubing: Make up joint with a dielectric connector.

3.4 PIPING PENETRATIONS

A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall, floor, or roof construction.

CONSTRUCTION	SLEEVE TYPE
1. Frame construction	None Required
2. Foundation walls	A*
3. Non-waterproof interior walls	B*
4. Non-waterproof interior floors on metal decks	D*
5. Non-waterproof interior floors not on metal decks	B*
6. Floors not on grade having a floor drain	A*
7. Waterproof floors not on metal decks	A
8. Waterproof walls	A

* - core drilling is permissible in lieu of sleeves where marked with asterisks.

B. Diameter of Sleeves and Core Drilled Holes

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.

2. Size holes thru exterior masonry walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:

a. Un-insulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.

b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.

c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

C. Length of Sleeves (except as shown otherwise on Drawings)

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.

2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:

a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.

3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.

4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

D. Packing of Sleeves and Core Drilled Holes

1. Use through-penetration firestop devices, forming materials, and fill, void or cavity materials to form through-penetration firestops to prevent the passage of flame, smoke, fumes, and hot gasses as detailed in the UL Fire Resistance Directory, Warnock Hersey Certification Listings Book, or the Omega Point Laboratories Listings Directory. Where applicable design is not detailed in the Directories use forming materials and fill, void or cavity material to form appropriate through-penetration firestop in accordance with printed details and installation instructions from the Company producing the acceptable forming materials and fill, void or cavity materials.

2. Firestop through-penetration of floors, walls, partitions, ceilings, and roof in accordance with the fire resistance rating assigned to the walls, partitions, floors, ceilings, and roofs on the Construction Work Drawings.

3. Pack sleeves in exterior masonry walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with one-part, non-sag polysulfide base sealant: Pecora's Synthacalk GC-9, Products Research and Chemicals PRC Rubber Calk 7000, or Sonneborn's One Part Polysulfide Sealant. Optional use of Mechanical Modular Seals is recommended.

E. Weld metal collars of sleeves to the upper surface of the metal deck. Seal voids under the metal collar as recommended by the manufacturer of the metal deck.

3.5 FLOOR, WALL AND CEILING PLATES

A. Install plates for exposed un-insulated piping passing thru floors, walls, and exterior concrete slabs as follows:

1. In Finished Spaces

a. Piping 4 Inch Size and Smaller: Solid or split, chrome plated cast brass.

b. Piping over 4 Inch Size: Split, chrome plated cast brass.

2. Unfinished Spaces (including exterior concrete slabs): Solid, unplated cast iron.

3. Fasten plates with set screws.

4. Plates are not required in pipe shafts or furred spaces.

3.6 PIPING AND FITTING SCHEDULE

A. A. Abbreviations: The following abbreviations are applicable to the Pipe and Fitting Schedule.

BS – black steel
GE – grooved end
SE – screwed end
ST – steel
SW – standard weight
WE – weld weight

B. Where options are given, choose only one option for each piping service. Deviations from selected option will be allowed if reviewed with Engineer prior to installation.

C. Schedule of Pipe and Fittings for the different piping services is as follows:

1. Heat Pump Ground Loop and Manifold: High Density Crosslinked Polyethylene.

2. Cold Water (CW) 125 psig and less:

a. All pipe sizes: Type L hard temper copper tubing with wrot copper solder fittings, and solder.

3. Heat Pump Water Supply and Return (HPWS & HPWR) 125 psig and less:

a. 3 inch and less: Type L hard temper copper tubing wit wrot copper solder fittings and solder.

b. 4 inch size: SW BS pipe, with SE & SW CI fittings, or WE & SW ST fittings, or GE & GE fittings.

4. Refrigerants (RS, RL, HG & RD) 350 psig and less: Type L hard temper copper tubing with wrot copper fittings, and brazing alloy unless otherwise specified.

a. Soft annealed refrigerant tubing 3/4 inch od and smaller may be used for final connections within 24 inches of refrigerant equipment.

5. Vents (V):

a. 4 inch and less: SW BS pipe with SE & SW CI fittings.

b. 5 inch and up: SW BS pipe, with SW & SW ST fittings.

6. Condensate Drain Piping: Type M hard temper copper tubing with wrot copper solder fittings, and solder.

END OF SECTION 232000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 232006

HYDRONIC SPECIALTIES

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 RELATED WORK SPECIFIED ELSEWHERE

HVAC Piping: Section 232000

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified.

B. Contract Closeout Submittals:

1. Operation and Maintenance Data: Submit 2 copies to the Engineer incorporated within maintenance manuals, covering the installed products.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTUERS

Taco
Bell & Gossett
Aurora Pumps

2.2 EXPANSION TANKS

A. Type B Expansion Tank: Pre-pressurized, welded steel (ASME Boiler and Pressure Vessel Code Section VIII, Division I) with heavy duty butyl rubber diaphragm, air charging valve, and drain valve.

1. Maximum Working Pressure: 125 psig.

2. Maximum Operating Temperature: 240 degrees F.

2.3 COMBINATION AIR SEPARATOR AND SYSTEM STRAINER

A. Type: Welded steel (ASME Boiler and Pressure Vessel Code Section VIII, Division I) with the following features:

1. Internal stainless steel strainer with 3/16 inch perforations and free area greater than 5 times the cross sectional area of the connecting pipe.

2. Bolted and gasketed removable cover plate.

3. Blowdown connection with ball valve.

B. Maximum Working Pressure: 125 psig.

C. Maximum Operating Temperature: 375 degrees F.

2.4 CHEMICAL BY-PASS FEEDER

A. A. By-Pass Feeder/Filter: Combined chemical addition and filtering, capacity of two gallons, complete with an opening in the top to facilitate charging with chemical, and a screen to properly distribute flow through feeder. Constructed of carbon steel, floor support legs, ¼ turn positive seal quick release cap, for a working pressure of 200 psi, provide 12 filter changes (min. 20 micron). Approved Manufacturers: JL Wingert Co, Neptune Chemical or Cannon.

2.5 CENTRIFUGAL SEPARATOR

A. Separator: Constructed of carbon steel with no moving parts or filter media, 125 psi maximum pressure rating, and capable of removing solids 74 microns/200 mesh in size and larger; Lakos Separators, Fresno, CA.

1. Automatic Purge Controller: Solid state single channel controller mounted in weather resistant metal enclosure with hasp style closure, and adjustable purging duration from 8 seconds to 30 minutes.

2. Motorized Ball Valve: Lakos Series LR-MBV.

2.6 AIR CONTROL FITTINGS

A. Insertion Type Tank Fitting (Expansion Tanks Less Than 100 Gallons): Cast iron body with copper dip tube and water relief tube.

1. Maximum Working Pressure: 125 psig.

2. Maximum Operating Temperature: 240 degrees F.

B. In-Line Type Tank Fitting (Expansion Tanks 100 Gallons and Larger): Cast iron body with bolted and gasketed cast iron cover, internal copper U tube, stainless steel ball check, and separate dip type air vent fitting.

1. Maximum Working Pressure: 125 psig.

2. Maximum Operating Temperature: 240 degrees F.

2.7 AIR VENTS

A. Type A: Manual Coin Operated Vent; ITT Bell and Gossett Model 4V.

1. Construction: Brass.

2. Maximum Working Pressure: 150 psig.

3. Maximum Operating Temperature: 212 degrees F.

B. Type B: Automatic Float Operated Vent; ITT Hoffman Model 78.

1. Construction: Brass body with stainless steel ball check, and 1/8 inch safety drain connection.

2. Maximum Working Pressure: 150 psig.

3. Maximum Operating Temperature: 250 degrees F.

2.8 PUMP SUCTION DIFFUSERS

A. Provide pump suction diffusers as indicated. Construct unit with angle pattern cast-iron body, threaded for 2" and smaller, flanged for 2-1/2" and larger, pressure rated for 175 psi. Provide inlet vanes with length 2-1/2 times pump suction diameter or greater. Provide cylinder strainer with 3/16" diameter openings with total free area equal to or greater than 5 times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head. Provide disposable fine mesh strainer to fit over cylinder strainer. Provide permanent magnet located in flow stream, removable for cleaning. Provide adjustable foot support designed to carry weight of suction piping. Provide blowdown tapping in bottom, gage tapping in side.

2.9 PUMP DISCHARGE VALVES

A. Provide pump discharge valves as indicated. Provide non-slam check valve with spring-loaded disc and calibrated adjustment feature permitting regulation of pump discharge flow and shutoff. Design valves to permit repacking under full line pressure, and with bolt-on bonnet. Provide flanged cast-iron valve body, pressure rated for 175 psi, maximum operating temperature of 300ºF (149ºC). Provide straight or angle pattern as indicated.

2.10 LIQUID FLOW SWITCHES

A. Provide liquid flow switches as indicated to sense flow and non-flow. Construct of brass for all wetted parts, provide packless construction. Provide paddle with removable segments for pipe size and flow velocity. Provide vapor-proof electrical compartment for switches mounted on cold hydronic piping systems. Furnish switches for 115 volt, 60 cycle, single phase with 7.4 amp. rating; or otherwise as indicated.

2.11 PRESSURE REDUCING VALVES

A. Provide pressure reducing valves as indicated to maintain operating pressure on boiler system. Brass construction, low inlet pressure check valve, inlet strainer removable without system shut-down, non-corrosive valve seat and stem, factory set at operating pressure.

1. Manufacturers: Bell & Gossett Model B7-12 (adjustable range 10-25 psig), or Bell & Gosset Model #7 (adjustable range 25-60 psig) or acceptable equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Diaphragm-Type Compression Tanks: Install diaphragm-type compression tanks on floor as indicated, in accordance with manufacturer's instructions. Vent and purge air from hydronic system, charge tank with proper air charge as recommended by manufacturer.

B. Combination Air Separator and System Strainer: Install the Work of this Section in accordance with the manufacturer's printed installation instructions.

C. Air Separator: Install in-line air separators in pump suction lines. Connect inlet and outlet piping. Install piping to compression tank with 1/4" per foot (2%) upward slope towards tank. Install drain valve on units 2" and over.

D. Chemical By-Pass Feeder / Filter: Provide each hydronic system with an independent chemical by-pass/feeder system. Installed accordance with manufacturer's printed installation instructions, complete with isolation valves, unions and bottom drain (ball) valve.

E. Air Control Fittings: Install piping to compression tank with 1/4" per foot (2%) upward slope towards tank. Install drain valve on units 2" and over.

F. Manual Vent Valves: Install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of flow for mains, branches, and runouts, and elsewhere as indicated.

G. Automatic Vent Valves: Install automatic vent valves at top of each hydronic riser and elsewhere indicated. Install shut off valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.

H. Glycol: Install glycol in accordance with manufacturer's printed installation instructions.

I. Pump Suction Diffusers: Install on pump suction inlet, adjust foot support to carry weight of suction piping. Install nipple and shutoff valve in blowdown connection. After cleaning and flushing hydronic piping system, but before balancing of hydronic piping system, remove disposable fine mesh strainer.

J. Pump Discharge Valves: Install in horizontal or vertical position with stem in upward position; allow clearance above stem for check mechanism removal. After hydronic system has been completed, mark calibrated name plate with stripe of yellow lacquer to permanently mark final balance position.

K. Liquid Flow Switches: Install liquid flow switches on inlet to water chiller, inlet to water condenser, and elsewhere as indicated. Install in horizontal pipe with switch mounted in tee on top of pipe with minimum of 24" of straight pipe with no fittings both upstream and downstream of switch. Remove segments of paddle to fit pipe in accordance with manufacturer's instructions. Wiring of liquid flow switches is specified in applicable Division-23 sections, and is included as work of this section.

L. Pressure Reducing Valves: Install for each hot water boiler and heat exchanger as indicated, and in accordance with manufacturer's installation instructions.

END OF SECTION 232006

SECTION 232113

GROUND-LOOP HEAT-PUMP PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Ground loop heat exchange systems, where shown on the Drawings and Schedules, shall include the following:

1. Crosslinked polyethylene (PEXa) piping.
2. Distribution manifold(s) with balancing and flow control valves where required.
3. Pipe-to-manifold national pipe thread fittings.
4. Cold-expansion fittings using metal compression sleeves.
5. Electrofusion fittings.
6. Supervision and field engineering required for the complete and proper function of the system.

1.2 RELATED SECTIONS

A. Section 23 21 23 – Hydronic Pumps

B. Section 31 20 00 – Earth Moving: Excavation and Backfill

1.3 REFERENCES

A. Publications listed here are part of this specification to the extent they are referenced. Where no specific edition of the standard or publication is identified, the current edition shall apply.

B. ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers

1. Ground-Source Heat Pumps: Design of Geothermal Systems for Commercial and Institutional Buildings (Textbook by Kavanaugh and Rafferty)

C. ASTM – American Society for Testing and Materials

1. ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
2. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
3. ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
4. ASTM F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
5. ASTM F2080 – Standard Specification for Cold-Expansion Fittings With Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe

D. CEN – European Committee for Standardization (Comité Européen de Normalisation)

1. EN 1555-3 – Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fittings

E. CSA – Canadian Standards Association

1. CSA B137.5 – Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications
2. CSA C448 – Design and Installation of Earth Energy Systems

F. DIN – German Institute for Standardization (Deutsches Institut für Normung)

1. DIN 16892 – Crosslinked high-density polyethylene (PE-X) pipes - General quality requirements and testing
2. DIN 16893 – Crosslinked high-density polyethylene (PE-X) pipes – Dimensions

G. IGSHPA – International Ground Source Heat Pump Association

1. Closed-Loop / Ground Source Heat Pump Systems, Design and Installation Standards

H. ISO – International Organization for Standardization

1. ISO 15875-1 – Plastic piping systems for hot and cold water installation - Crosslinked polyethylene (PE-X) - Part 1: General
2. ISO 15875-2 – Plastic piping systems for hot and cold water installation - Crosslinked polyethylene (PE-X) - Part 2: Pipes
3. ISO 15875-3 – Plastic piping systems for hot and cold water installation - Crosslinked polyethylene (PE-X) - Part 3: Fittings
4. ISO 9001 – Quality Management Systems - Requirements
5. ISO 14531-2 – Plastic pipes and fittings - Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels. Fittings for heat-fusion joining

1.4 DEFINITIONS

A. "The closed-loop portion [ground loop heat exchange] of a ground source heat pump system consists of a long plastic pipe buried below the earth's surface. This plastic pipe is buried in the ground, or ground coupled, to allow heat transfer between the fluids and the earth. The heat pump transfers thermal energy to and from the closed, buried pipe and the building's thermal load. The system consists of a closed-loop buried pipe, a water source heat pump, and an air [or water] distribution system for directing heated or cooled air [or water] to specific locations in the building." (IGSHPA Installation Guide, p1).

B. Crosslinked polyethylene, or PEX is a modified polyethylene material, typically high-density polyethylene (HDPE), which has undergone a change in the molecular structure using a chemical or a physical process whereby the polymer chains are permanently linked to each other. This crosslinking of the polymer chains results in improved performance properties such as elevated temperature strength, chemical resistance, environmental stress crack resistance (ESCR), slow crack growth (SCG) resistance, toughness and abrasion resistance. Crosslinking also makes PEX a "semi-thermoset" polymer, providing excellent long-term stability.

This specification requires PEX to be designated as PEXa and be manufactured by the high-pressure peroxide method.

1.5 SUBMITTALS

A. Comply with Section 01 33 00, Submittal Procedures. Approval and/or acceptance of all submittals is required prior to fabrication.

B. Product Data: Submit manufacturer's Technical Manual, submittal forms, catalog cuts, brochures, specifications, and installation instructions. Submit data in sufficient detail to indicate compliance with the contract documents.

C. Submit manufacturer's instructions for installation.

D. Submit data for equipment, fittings, fasteners and associated items necessary for the installation of the piping and manifolds.

E. Submit computer-generated ground loop heat exchange system design indicating total pipe required, ground loop configuration (i.e. borehole, single pipe horizontal, slinky, horizontal, etc), pipe diameter, borehole or trench separation, ground thermal conductivity and diffusivity, and entering and leaving water temperatures. Ground loop heat exchange design calculations shall be performed on industry recognized software.

F. Drawings: Provide plans drawn to scale for all installation areas.

1. Indicate dimensions, descriptions of materials, general construction, component connections, and installation procedures.

2. Indicate design, schematic layout of system, including equipment, critical dimensions and piping/slab penetration details as well as details for protecting exposed PEXa piping.

G. Maintenance Instructions: Submit instructions for maintenance.

1.6 QUALITY ASSURANCE

A. Comply with Section 01 43 00, Quality Assurance.

B. Manufacturer: Must be a company specializing in the Work of this Section with a minimum of 5 years documented experience.

C. Pipe shall be manufactured in a facility whose quality management system is ISO 9001 certified.

D. Pipe and fittings shall be IGSHPA approved.

E. Pipe and U-bends shall be certified to CSA C448 by a third-party certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 60 00, Product Requirements.

B. Deliver and store piping and equipment in shipping containers with labeling in place.

1. Pipe shall be kept in original shipping packaging until required for installation.

C. Store piping and equipment in a safe place, dry, enclosed, under cover, in a well-ventilated area.

1. Do not expose pipe to ultraviolet light beyond exposure limits recommended by manufacturer.

2. Protect piping and manifolds from entry of contaminating materials. Install suitable plugs in open pipe ends until installation.

3. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants and cross-connections.

4. Piping shall not be dragged across the ground or other surfaces, and shall be stored on a flat surface with no sharp edges.

D. Protect materials from damage by other trades.

E. Pipe shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by manufacturer.

1.8 WARRANTY

A. Provide manufacturer's standard written warranty.

1. The pipe manufacturer shall warrant the crosslinked polyethylene pipe to be free from defects in material and workmanship for a period of twenty-five (25) years.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Basis of design - RAUGEO™ Ground Loop Heat Exchange System for geothermal applications as manufactured by REHAU Construction LLC, 1501 Edwards Ferry Road, NE; Leesburg, VA 20176; email: rehau.mailbox@rehau.com; website: na.rehau.com; upon whose products and equipment these specifications are based.

B. Approved equals are allowed.

2.2 PIPING

A. Ground loop heat exchange pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to (a) ASTM F876 and (b) CSA B137.5 and (c) CSA C448 or (d) ISO 15875-1:2003, 15875-2:2003 or (e) DIN 16892 and 16893

B. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F (690 kPa @ 82°C) temperature, and 160 psi gauge pressure at 73.4°F temperature (1,103 kPa @ 23°C).

C. Horizontal Heat Exchanger:

1. The minimum bend radius for cold bending of the pipe shall be no less than five (5) times the outside diameter. Bends tighter than this minimum shall require the use of a bending template, as supplied by the pipe manufacturer, and hot air.

D. Vertical Borehole Heat Exchanger:

1. The vertical borehole heat exchanger tip shall be manufactured of one continuous pipe, with no joints in the borehole or shall be manufactured from coated stainless steel components manufactured to the ASTM F2080 standard.

2. The vertical borehole heat exchanger shall be a single U-bend or a double U-bend system, consisting of 2 single U-bend pipes attached together.

3. The vertical borehole heat exchanger tip shall be covered in a GRP resin or a rubber coating.

2.3 FITTINGS

A. All buried fittings shall be of a permanent design.

B. Cold-expansion compression-sleeve fittings shall conform and be third-party certified to ASTM F2080, and CSA B137.5.

C. Cold-expansion compression-sleeve fittings shall be manufactured of brass or stainless steel and shall be supplied by the piping manufacturer as part of a proven cataloged system.

D. All electrofusion fittings intended for ground loop heat exchange applications shall conform to ASTM F1055 or EN 1555-3.

2.4 MANIFOLDS

A. Material: Distribution manifolds shall be manufactured of brass or polypropylene and be supplied by the piping manufacturer as a part of a proven cataloged system.

B. Brass manifolds shall be produced from extruded brass round pipe with tapped holes for connections, and be pre-assembled by the manufacturer. 100% of manifolds used shall have been air tested by the manufacturer with no indication of leaks.

C. Polypropylene manifolds shall be produced from extruded polypropylene SDR 11 pipe containing a fiber layer to restrict thermal expansion. Holes shall be tapped for connections. Outlet ports shall be fusion welded onto the body of the manifold, with integrated fittings for connection to the borehole field. Fusion welding shall be done in a factory setting to ensure quality of the manifold. Manifold shall be supplied by the manufacturer with all components pressure tested and with no indication of leaks.

D. Balancing Manifolds

1. Where required by design, manifolds shall be equipped with supply and return manifold isolation valves, integral thermometer and manometer housings, and air vent/fill ports.

2. Where required by design, each circuit shall be supplied with circuit isolation valves, integral visual flow gauges and brass cold expansion compression-sleeve fittings to connect to IGSHPA-approved PEXa pipe.

PART 3 EXECUTION

3.1 ACCEPTABLE INSTALLERS

A. Installation shall be performed by qualified laborers trained in the procedures of ground loop heat exchange systems and have IGSHPA certification.

3.2 EXAMINATION

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means acceptance of existing conditions.

3.3 THERMAL CONDUCTIVITY TEST

A. Soil thermal conductivity test shall be performed according to IGSHPA Closed-Loop / Geothermal Heat Pump Systems, Design & Installation Standards, 2008.

3.4 PREPARATION

A. Coordinate with related trades and manufacturer's recommendations with regard to installation in conjunction with:

1. Drilling
2. Excavation
3. Pipe fusion
4. Heat pump location

3.5 INSTALLATION

A. Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.

B. Mount manifolds in the locations previously prepared or in previously installed cabinets, if used. Manifolds shall be mounted as level as possible, with the venting device on the uppermost section.

C. Route piping in an orderly manner, according to layout and spacing shown in final shop drawings.

D. At connections and fittings, use a plastic pipe cutter to ensure square and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants. Where compression-sleeve fittings are installed within the ground, they shall be wrapped in a heat-shrink material approved by the manufacturer.

E. Piping that shall pass through expansion joints shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches (40 cm) on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation of thermal mass.

F. Where piping exits the thermal mass, a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches (15 cm) into the floor and exiting by a minimum of 6 inches (15 cm). For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.

G. At the time of installation of each circuit of pipe, connect the pipe to the correct manifold outlet and record pipe length for balancing. If manifold is not installed, cap the end of the pipe and label the pipe's circuit numbers along with S for supply and R for return. Connect pipes to manifold as soon as possible and record circuit lengths. Circuits shall be labeled to indicate circuit length and serviced area.

3.6 FIELD QUALITY CONTROL

A. Filling, Testing & Balancing: Tests of ground loop heat exchange systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.

B. Pressure gauges used shall show pressure increments of 1 psig and shall be located at or near the lowest points in the distribution system.

C. Air Test

1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
2. Do not exceed 150 psig.
3. Use liquid gas detector or soap solution to check for leakage at manifold connections.

D. Water Test

1. Purge air from pipes.
2. Charge the completed, yet unconcealed pipes with water.
3. Take necessary precautions to prevent water from freezing.
4. Check the system for leakage, especially at pipe joints.

E. Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psig for 30 minutes.

1. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes.
2. At the end of the 30-minute preliminary test, pressure shall not fall by more than 8 psig from the maximum, and there shall be no leakage.

F. After successfully performing the preliminary test, perform the main pressure test immediately.

1. The main pressure test shall last 2 hours.
2. The test pressure shall be restored and shall not fall more than 3 psig after 2 hours.
3. No leakage shall be detected.

3.7 PROTECTION

A. Protect installation throughout construction process until date of final completion.

B. Replace components that cannot be repaired.

END OF SECTION

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 232123

PUMPS

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 RELATED WORK SPECIFIED ELSEWHERE

Wiring for Mechanical Equipment: Section 230511
Motor Controls: Section 230512

1.3 SUBMITTALS

A. Product Data: Catalog sheets and installation instructions for each type or size pump.

B. Schedule: Pump schedule showing pump specifications and application.

C. Quality Control Submittals: Performance curves for each pump, showing gpm, brake HP and efficiency from free delivery to shut-off. Chart curves on manufacturer's factory tests shall be conducted in accordance with the recommended procedures of the Hydraulic Institute, and certified thereto by the manufacturer.

D. Contract Closeout Submittals: Operation and Maintenance Data: Submit 2 copies to the Engineer, incorporated within maintenance manuals, covering the installed products.

1.4 MAINTENANCE

A. Spare Parts: Deliver one spare set of mechanical seals for each size and type of in-line, coupled and base mounted circulating pump to the Owner's Representative, who will sign receipt for same. Provide seals of type as required for the particular pump application and the chemical water treatment being utilized. Suitably box and label spare seals as to their usage.

B. Parts List: Submit complete parts list for each type of pump or pumping apparatus.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Taco
Bell & Gossett
Aurora Pumps

2.2 PUMPS - GENERAL

A. Provide pumps that will operate continuously without overheating bearings or motors at every condition of operation on the pump curve, or produce noise audible outside the room or space in which installed.

B. Provide pumps of size, type and capacity as indicated, complete with electric motor and drive assembly, unless otherwise indicated. Design pump casings for the indicated working pressure and factory test at 1-1/2 times the designed pressure.

C. Provide pumps for propylene glycol usage as specified for water, of type as indicated.

D. Provide pumps of the same type, the product of a single manufacturer, with pump parts of the same size and type interchangeable.

E. Provide pumps using oil for lubrication, with the exception of in-line circulating and close coupled pumps, with constant level oilers.

F. Provide base mounted pumps with metal guards installed over the moving drive assembly. Fabricate guards from expanded galvanized metal or galvanized sheet metal, designed to meet all safety codes. Secure guards as required and acceptable.

G. When variable frequency drives are used to control pump speed provide the manufacturer's recommended flexible coupling capable of operating at various torque and speed ratings. Coordinate with drive manufacturer.

2.3 CIRCULATING WATER PUMPS

A. In-Line Pump: Provide single stage volute type pump, with a cast or forged bronze impeller, replaceable mechanical seals, oil lubricated shaft sleeve bearings and a cast iron casing with flanged inlet and outlet connections. Direct connect pump to electric motor with a flexible coupling.

1. Motor Requirements (Supplementary to Section 230951):

a. Equip motor with built-in thermal overload protection.

b. Nominal full-load three phase motor efficiency:

HP	PERCENT
1-2	84.0
3-6	88.0
7-14	89.5

B. Close-Coupled Pump: Provide a horizontal, volute, single stage, end suction centrifugal type, with mechanical seals and a casing and frame of cast iron. Design casing for a 125 psig working pressure, with a vent cock in the top and drain plug in the bottom, with flanged inlet and outlet connections. Provide bronze impeller of the closed type, keyed to shaft and held in place with a self-locking bronze impeller nut. Direct connect pump to electric motor with a flexible coupling, or shaft may be common for pump and motor. Fabricate shaft from 1035 SAE steel, with AISI Type 316 stainless steel or bronze shaft sleeves.

1. Motor Requirements (Supplementary to Section 230951):

a. Nominal full-load three phase motor efficiency:

HP	PERCENT
1-2	84.0
3-6	88.0
7-14	89.5

C. Base Mounted Pump: Provide a horizontal, volute, single stage, end suction centrifugal pump with mechanical seals and a casing and frame of cast iron. Design casing for a 125 psig working pressure, with a vent cock in the top and drain plug in the bottom, with flanged inlet and outlet connections. Provide bronze impeller of the closed type, keyed to shaft and held in place with a self-locking bronze impeller nut. Fabricate shaft from 1035 SAE steel, with AISI Type 316 stainless steel or bronze shaft sleeves. Direct connect pump to electric motor with a flexible coupling. Mount pump and driving motor on a common cast iron base or a heavy steel bed plate, with suitable lugs for anchor bolting.

1. Provide chilled water, secondary water and primary water pumps, driven by motors 5 HP and larger with a drip lip type base. Pitch drip lip to pump end and terminate in a tapped drain connection.

2. Motor Requirements (Supplementary to Section 230951):

a. Nominal full-load three phase motor efficiency:

HP	PERCENT
1-2	84.0
3-6	88.0
7-14	89.5
15-24	91.0

2.4 CHARTS AND DIAGRAMS

A. Lubrication Charts: Card holder with aluminum or stainless steel frame, plexiglass front and sheet aluminum card backing plate. Minimum size card 8 x 10 inches. Illustrate or type the manufacturer's recommendations for lubrication of each type pump.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in-line circulating pumps between pipe flanges in piping systems. Install overhead pipe supports, both sides of in-line pumps, installed in horizontal piping runs.

B. Install close-coupled, base mounted and all floor supported pumps or pumping apparatus on concrete pump foundations, or vibration isolating bases, or both, all as noted on drawings or specified. Level, align and true the equipment utilizing steel shims. Bolt to construction and grout, when grouting holes are provided in bases.

END OF SECTION 232123

SECTION 232515

GLYCOL FEED SYSTEM

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.

B. All work under this title, on drawings or specified, is subject to the architectural general and special contract conditions for the entire project, and the contractor for this portion of the work is required to refer especially thereto, and to the architectural drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

HVAC Piping: Section 232000
Valves: Section 230523
Cleaning and Testing: Section 230593

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, standard schematic drawings, specifications and installation instructions.

B. Contract Closeout Submittals

1. Operation and Maintenance Data: Provide one copy of written instructions, framed under rigid plastic, on the procedures, tests required and dosages to be used for the treatment of the system.

1.4 MAINTENANCE

A. Extra Materials: Provide feed tank with 50 Gallons of 40% premixed glycol solution tank shall be full at project close-out.

PART 2 PRODUCTS

2.1 MANUFACTURERS/COMPANIES

J. L. Wingert Co. - Model #GL50-E1
Neptune Chemical Pump Company – Model #G-50-1A

2.2 AUTOMATIC GLYCOL FEED PACKAGE

A. Automatic glycol feed package: shall consist of a polyethylene tank, hinged polyethylene lid, carbon steel frame, 120/1/60 with power cord plug, NEMA 4X control panel, low level float switch, 1/3HP open motor bronze gear pump with internal relief valve, pressure switch, relief valve, check valve, Schedule 80 PVC plumbing and vinyl braided hose. Contractor assembled systems are not acceptable.

1. Tank and Frame: Polyethylene tank shall be industrial grade with a nominal wall thickness of 1/4". Shoebox type lid shall be 1/3 the diameter hinged with 304 stainless steel piano hinge and 316 stainless steel rivets. Tank frame shall be constructed of carbon steel with bracing for plumbing and control panel. Tank frame shall have 10 gauge pump mount shelf and be coated with water based enamel paint.

2. Pressure Switch: Pressure switch will be prewired to control panel to turn on and off the gear pump based on rising and falling pressure settings.

3. Control Panel: Fiber filled polycarbonate NEMA 4X control panel shall be of ample size for equipment needed and servicing of electrical components. All exterior components shall be rated NEMA 4X and installed per manufacturers instructions. Wiring and wiring diagram shall be color-coded for easy trouble shooting. All internal wire shall be 16-gauge minimum. Controls are, but not limited to, main power switch and indicator light, pump hand/off/ auto switch and indicator light, and red low-level indicator light, audible alarm with push button silence and dry contact for low level indication.

4. Pressure Relief Valve: Valve will incorporate a gauge with pressure range relative to system pressure settings.

5. Check Valve: Back flow check valve shall be tapered valve body design with an enlarged valve chamber to reduce valve chatter. PVC construction with stainless steel spring and raised radius valve seat for positive seal.

6. Low Level Switch: Polypropylene low level switch shall be interlocked with pump feed and low level indicator. Low level will stop all pump operations when level falls below the factory set point.

7. Provide one year manufacturer's warranty from date of substantial project completion

2.3 PROPYLENE GLYCOL

A. The heat transfer medium shall be at 40% by volume inhibited propylene glycol mixture (fluorescent yellow fluid color) of Dow Chemical Co. - Dowfrost HD.

B. All manufacturers recommendations in regard to filling, initial system cleaning, and purging shall be adhered to completely.

C. The Heating (Sub) Contractor shall provide final water / glycol analysis report.

PART 3 EXECUTION

3.1 INSTALLATION

A. Automatic Glycol Feed Package, complete with valves and piping, as recommended by the equipment manufacturer and indicated on the drawings.

B. Glycol System(s): following system cleaning, fill specified glycol system and feed tank to indicated percentage of glycol/water solution indicated. Glycol feed tank shall be topped off at project closeout.

C. Connections or extension of existing glycol piping systems: Prior to connecting to the existing system(s), the Mechanical Contractor shall take sample of fluid and provide test reports of the existing fluids concentration of glycol and residuals to the Engineer for acceptance. If the test results have not been provided prior to connection, the Mechanical Contractor shall be held responsible in bringing the entire hydronic system within acceptable specifications. The Mechanical Contractor shall top off the new or existing glycol feed tank, at project closeout.

3.2 FIELD QUALITY CONTROL

A. Test the system for the concentration of glycol and residuals and provide test results to engineer for approval.

B. Furnish a qualified representative to train operating personnel, selected by the Owner, in the procedures and test required to maintain the system.

END OF SECTION 232515

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233113

METAL DUCTWORK

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 including but not limited to, Coordination Drawings in Division 1 Section "Project Management and Coordination".

1.2 RELATED WORK SPECIFIED ELSEWHERE

Common Work Results for HVAC: Section 230500
Duct Insulation: Section 230713
Ductwork Accessories: Section 233300
Diffusers, Registers, and Grilles: Section 233713
Balancing of Systems: Section 230594

1.3 REFERENCES

National Fire Protection Association (NFPA).
Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Current published edition.

1.4 SUBMITTALS

A. Fabrication Drawings: Submit 1/4" = 1'-0" (minimum) scaled reproducible drawings of metal ductwork and fittings including but not limited to: ductwork layout detailing, sizes, fabrication lengths, locations, elevations, slopes of horizontal runs. In addition indicate wall and floor penetrations, lighting, diffuser, building walls, steel locations with elevations and reflected ceilings (ceiling type and elevations noted). Show interface and space relationships between all items located above ceiling including but not limited to ductwork and equipment. (Submission of Engineers contract document Drawings will not be acceptable).

B. Shop Drawings: Submit duct construction standards to include: schedule of all ducted air systems (indicating pressure class, materials, and seal class), sheet metal type, connections, reinforcement, turning vanes, fitting types, method of support, upper hanger attachment, ductliner specification.

1.5 QUALITY ASSURANCE

A. SMACNA: Gages of materials, fabrication, reinforcement, sealing requirements, installation, and method of supporting ductwork shall be in accordance with the following SMACNA manuals, unless otherwise shown and/or as specified:

1. HVAC Duct Construction Standards – Third Edition 2005.

B. Conform to the applicable requirements of NFPA 90A, 90B and 96.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel: ASTM A653 lock forming quality - galvanizing: ASTM A924 coating designation G-90.

B. Aluminum: ASTM B-209, Alloy 3003, Temper H-14.

C. Stainless Steel: AISI Types 302, 304 and 316, as specified.

2.2 FABRICATION

A. Fabricate all ductwork in accordance with this specification and SMACNA.

B. Fabricate all ductwork from galvanized, stainless steel, carbon steel, aluminum and PVC coated sheet metal as indicated.

C. Round and flat oval ductwork shall be fabricated using spiral seam construction only. Snaplock seams are not allowed.

D. Rectangular and Round ductwork radius of all 90º through 45º elbows shall be 1.5 times the elbow diameter, unless otherwise noted. The radius of all 15º through 30º elbows shall be 1.0 times the elbow diameter. Mitered elbows shall be provided with turning vanes. Rectangular square throat 90º without turning vanes are not allowed.

E. Dissimilar Metals: Separate dissimilar metals used for ductwork with 10 oz. canvas impregnated with zinc chromate. No separation is required between screws or rivets and the materials in which they are inserted.

F. Sheet Metal:

1. Minimum Rectangular Duct Construction to 2" W.G. unless noted otherwise on the contract drawings. For pressure class above 2" refer to SMACNA standards tables.

2. All ductwork panels 18" and greater in width/height, 20 gage or less shall be cross broken or beaded. Internally lined ductwork is exempt from this requirement.

3. Duct construction: reinforcement, gages and sealing on fittings, elbows and short lengths of ductwork shall be continuous throughout the system.

Duct Dimension longest side	*Duct Length	Minimum Duct Gage	Transverse Joint Connection / Reinforcement
Up to 16"	48"	24	S-Slip & Drives (Min. 24 ga.)(c)
17" to 28"	48"	24	Flanged (a)(c)
29" to 36"	48"	24	Flanged (a)(c)
37" to 48"	48"	22	Flanged (a)(b)(c)(e)
48" to 84"	48"	20	Flanged (a)(b)(c)(e)
84" to 96"	48"	18	Flanged (a)(b)(c)(e)
97" to 108"	48"	16	Flanged (a)(b)(d)(e)
107" & UP	Refer to SMACNA Tables for pressure class specified		

a. Flanged ductwork joint connections shall be: SMACNA T-22, T-24, T-24a, T25a, T25b or slip-on flanges. (IE: Ductmate, Ward, Nexus, TDH and TDF installed per manufacturer's recommendations).

b. Intermediate reinforcement per SMACNA 2005

c. Longitudinal seam to be Pittsburgh, (snaplock seams are not allowed).

d. Longitudinal seam to be welded.

e. Refer to SMACNA reinforcement tables for additional intermediate required reinforcements.

4. Round Duct Construction - Minimum duct wall thickness unreinforced 2" W.G. positive/negative pressure.

Duct Dimension	Spiral Seam
6"	28
8"	28
10"	28
12"	28
14"	28
16"	26
18"	26
19" - 26"	26
27" - 36"	24
37" - 50"	22
51" - 60"	20
61" - 84"	18

Round ductwork shall be a manufactured duct system consisting of fittings that are factory fitted with a sealing gasket and spiral duct which, when installed according to the manufacturer's instructions, will seal the duct joints without the use of duct sealer. Round ductwork shall be fabricated using spiral seam construction. (Snaplock seams are not allowed). Acceptable Manufacturers: Lindab (SPIROsafe); Semco (Custom Air); United McGill Corporation (Uni-Gasket).

a. All fitting ends shall come factory equipped with a EPDM rubber gasket. Gasket shall be manufactured to gauge and flexibility so as to insure that system will meet all of the performance criteria. Gasket shall be classified by Underwriter's Laboratories to conform to ASTM E84-91a and NFPA 90A flame spread and smoke developed ratings of 25/50.

b. Fitting ends shall be calibrated to dimensional tolerance standard of the associated spiral duct.

c. Fitting ends from 3" to 24" diameter shall have over edges for added strength and rigidity.

d. Elbows from 3" to 12" diameter shall be 2-piece die stamped and continuously stitch welded. All elbows 14" diameter and larger shall be standing seam gorelock construction and internally sealed.

e. The fittings shall be either spot-welded or button punched construction and shall be internally sealed. When contract documents require divided flow fittings, only full body fittings will be accepted.

f. Volume dampers as specified in 233300 - Ductwork Accessories.

2.3 SUPPORT

A. Duct Hangers

1. Strap Hangers: As indicated below and/or same material as duct.

2. Rod Type Hangers: Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with 2 removable nuts each end for positioning and locking rod in place. Unless stainless steel, galvanized or cadmium plated; shop coat with metal primer.

Maximum Half of Duct Perimeter	Strap @ 10 ft Spacing	Rod @ 10 ft Spacing	Strap @ 8 ft Spacing	Rod @ 8 ft Spacing	Strap @ 5 ft Spacing	Rod @ 5 ft Spacing	Strap @ 4 ft Spacing	Rod @ 4 ft Spacing
P/2 = 30"	1" x 22 ga	10 ga.	1" x 22 ga.	10 ga.	1" x 22 ga.	12 ga.	1" x 22 ga.	12 ga.
P/2 = 72"	1" x 18 ga	3/8"	1" x 20 ga.	1/4"	1" x 22 ga.	1/4"	1" x 22 ga.	1/4"
P/2 = 96"	1" x 16 ga	3/8"	1" x 18 ga	3/8"	1" x 20 ga	3/8"	1" x 22 ga	1/4"
P/2 = 120"	1 ½" x 16 ga	½"	1" x 16 ga	3/8"	1" x 18 ga	3/8"	1" x 20 ga	1/4"
P/2 = 168"	1 ½" x 16 ga	½"	1 ½" x 16 ga	½"	1" x 16 ga	3/8"	1" x 18 ga.	3/8"
P/2 = 192"	-	½"	1 ½" x 16 ga	½"	1" x 16 ga	3/8"	1" x 16 ga.	3/8"

B. Miscellaneous Fasteners and Upper Hanger Attachments:

1. Sheet Metal Screws, Machine Bolts and Nuts: Same material as duct, unless otherwise specified.

2. Concrete Inserts: Steel or malleable iron, galvanized; continuously slotted or individual inserts conforming with MSS SP-58, Types 18 & 19, Class A-B.

3. C Clamps: Fee & Mason Co.'s 255L with locking nut, and 255S with retaining strap.

4. Metal Deck Ceiling Bolts: B-Line Systems, Inc.'s Fig. B3019.

5. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.

6. Structural (carbon) Steel Shapes and Steel Plates: ASTM A36, shop primed.

7. Stainless Steel Shapes and Plates: ASTM A276 and ASTM A666.

8. Machine Bolt Expansion Anchors:

a. Non-calking single unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 1.

b. Non-calking double unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 2.

c. Self - drilling type: FS FF - S - 325, Group III, Types 1 and 2

2.4 SEALANTS

A. Acceptable Manufacturers: Duro Dyne Corp.; Foster Products Div., H.B. Fuller Co.; Hardcast Inc.; United Sheet Metal Div., United McGill Corp.

B. U.L. Listed adhesives (liquid or mastic), scrim, or combinations thereof, as required for pressure class; suitable for system operating temperatures; compatible with media conveyed within, insulation (if any), and ambient conditions.

C. Use of duct tape or silicone caulk for sealing seams and joints is not acceptable.

2.5 ACOUSTICAL DUCT LINING

A. Requirements of Regulatory Agencies:

1. The liner shall meet the Life Safety Standards as established by NFPA 90A and 90B and should not support microbial growth as tested in accordance with ASTM G21 and G22.

2. The duct liner shall conform with the requirements of ASTM C 1071 with NRC not less than 0.70 as tested per ASTM C423 using a Type "A" mounting, and with a thermal conductivity no higher than .25 at 75EF mean temperature.

3. Installation of duct lining shall be in accordance with the appropriate SMACNA Manual installation detail on drawing as amended by this Section.

B. Acceptable Manufacturers: Johns Manville Mechanical Insulations Linacoustic RC; or approved equal.

C. Materials

1. Duct Lining: Minimum 1" thick fibrous glass, with the side exposed to the airstream coated with a tough, acrylic polymer to guard against incursion of dust or dirt into the substrate. The surface coating shall be specially formulated with an immobilized, EPA-registered anti-microbial agent so it will not support the growth of fungus or bacteria, as determined by test in accordance with ASTM C 1071 and ASTM G21 and G22. Edge coating shall be factory applied to assure coverage of the leading edges per SMACNA requirements. Material shall be a standard catalog item as furnished by a nationally recognized manufacturer.

2. Adhesive shall be approved by the duct liner manufacturer and shall meet ASTM C 916

3. Mechanical Fasteners: Furnish fasteners complete with weld pins and retaining clips for securing lining to ductwork. Weld pins shall not distort, mar or burn the ductwork. Acceptable Products: Graham Co. Weld Pins.

4. Sound Absorption Coefficients: Minimum acceptable coefficients as tested per ASTM C423-61 and ASTM E795

Product Thickness	Mounting Type	Octave Band (Hz)						NRC
		125	250	500	1000	2000	4000	
1"	"A"	0.08	0.31	0.64	0.84	0.97	1.03	0.70

D. Installing Duct Lining in Low Velocity Ductwork

1. Install duct lining in accordance with SMACNA "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems", except as specified otherwise herein and indicated on drawings.

2. Ductwork dimensions noted on the drawings are the inside duct dimensions after the application of lining.

3. Bond liner to ductwork with a 100% coverage of adhesive, with the factory coated liner surface facing the airstream. Start installation of fasteners within 3" of the leading edge of all transverse joints within upstream leading edge of duct lining. Refer to drawings for installation detail.

4. All exposed leading edges and transverse joints shall be neatly butted without gaps and be coated with factory-applied edge coating or field-applied factory approved edge treatment. Metal nosings shall be securely installed over transversely-oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct. In addition, coat all exposed surfaces of mechanical fasteners and sheet metal nosing with vapor barrier mastic.

2.6 SEALING REQUIREMENTS

A. Sealing Requirements

1. Construct as a minimum to the following pressure and seal class.

System	Pressure Class	Seal Class
Supply, return and outside air duct	+2"	'A'
Exhaust and relief duct	-2"	'A'

PART 3 EXECUTION

3.1 INSTALLATION

A. Install ductwork to allow maximum headroom. Properly seam, brace, stiffen, support and render ducts mechanically airtight. Adjust ducts to suit job conditions. Coordinate with all trades proposed locations of ductwork prior to installation.

B. Provide necessary transformation pieces and flexible fabric connections for ductwork connected to air handling equipment or air inlet and outlet devices.

C. All transitions shall be made with less than 30E included angle.

D. Provide safing to properly close off all openings in ductwork or sleeves in which any duct accessory is being installed as required by irregular openings or off-size equipment. All attempts shall be made to maximize the size of the accessory to the opening or duct.

E. Ductwork installations exposed to view in finished spaces (refer to project documents) shall receive special attention by contractor. Care shall be taken to provide a neat uniform look, Round duct spiral seams shall align. Ductwork will be free of foreign matter (IE: construction debris, mud, dirt, excessive duct sealer, ETC.) Do not install damaged ductwork. Remove damaged ductwork at the direction of the engineer. Ductwork indicated to be painted (refer to project documents). Duct shall be wiped clean of grease, oils and any foreign materials not conducive to the adhering of paint.

F. Coordinate the installation of all mechanical systems. Provide sufficient space around ductwork and equipment during installation to allow the proper application of insulation. As needed insulate ducts prior to erection in place when ducts are required to be installed proximate to walls, ceilings, equipment or other ductwork, which will not permit adequate space for the installation of insulation, at a later date. Exercise reasonable care in the installation of insulated ductwork, so that insulated surfaces are in perfect condition before and after installation.

G. Ductwork seen behind registers, in other words; ductwork visible through a register (inside the duct) shall be painted using one coat of flat black metal paint (after proper surface cleaning). Paint coverage shall be that no unpainted duct will be seen. This applies to all grilles, registers and diffusers.

3.2 SEALING SEAMS, JOINTS, AND PENETRATIONS

A. Conform to SMACNA Seal Class A as a minimum regardless of pressure class except for continuously welded or soldered seams, where called for. Helical (spiral) lock seams are exempt from sealant requirements. All other duct surface connections made on the perimeter of the duct are deemed to be joints. Use of duct tape for sealing of seams and joints is not acceptable.

B. Sealing requirements shall include, but not be limited to: transverse (girth) joints; longitudinal seams; duct wall penetrations; branch and sub-branch intersections; duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum and casing abutments to building structures.

C. Pittsburgh sealing, sealant shall be applied in the Pittsburgh pocket prior to hammering. Sealant applied to the interior (back side of seam) of duct or to the exterior of seam is unacceptable.

D. Ducts and plenums connecting to louvers (intake, exhaust, relief) shall be constructed with the bottom of duct/plenum sloped so that water drains back and out of the louver or to a central drain connection within the plenum. If a drain connection is provided, pipe to nearest floor drain. The duct or plenum shall be sealed as directed in 3.02, A (above). In addition, all seams of lower 6" (or greater, if higher water level potential exists) shall be soldered, or otherwise gasketed and sealed to create water-tight seams, joints and penetrations.

3.3 DUCT MATERIAL INSTALLATION SCHEDULE

A. Fabricate ductwork from galvanized sheet metal with the exception of those described in B (stainless steel):

1. Supply, return, exhaust and outside air ductwork.

B. Fabricate the following ductwork from stainless steel:

1. Supply air ductwork downstream of humidifiers. Use AISI Type 302 or 304 stainless steel.

3.4 ACOUSTICAL DUCT LINING

A. In all locations indicated on drawings.

B. Install duct lining from the horizontal ceiling heat pump discharge to the first branch runout or 15 feet.

C. Install duct lining in the return air ductwork from the horizontal ceiling heat pump.

3.5 HANGERS FOR DUCTS

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:

1. Rectangular ducts up to 42 inches wide, not having welded or soldered seams, and supported from overhead construction; extend strap hangers down over each side of the duct and turn under bottom of duct a minimum of 2 inches. Secure hanger to duct with 3 full thread sheet metal screws, one in the bottom and 2 in the side of the duct.

2. Prime coat plain steel rods threaded at the site immediately after installation with metal primer.

3.6 UPPER HANGER ATTACHMENTS

A. General: Secure upper hanger attachments to structural steel or steel bar joists wherever possible.

1. Avoid damage to reinforcing members in concrete construction.

2. Metallic fasteners installed with electrically operated or powder driven tools may be used as upper hanger attachments, in accordance with the SMACNA Manual.

B. Prohibited Use

1. Drive-on beam clamps (caddy clamp), flat bars or bent rods, as upper hanger attachments.

2. Powder driven drive pins or expansion nails.

3. Powder driven or welded studs to structural steel less than 3/16 inch thick.

4. Loads in excess of 250 lbs from a single welded or powder driven stud.

5. Powder driven fasteners in precast concrete.

6. Do not use c-clamps to attach hangers in a shear type application. Use sheet metal screws, machine bolts and nuts or welds.

C. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.

1. Secure upper hanger attachments to steel bar joists at panel points of joists.

2. Do not drill holes in main structural steel members.

D. Attachment to Concrete Filled Steel Decks:

1. Existing Construction: Install expansion shields.

2. New Construction: Install concrete inserts or metal deck ceiling bolts.

3. Do not attach hangers to decks less than 2-1/2 inches thick.

3.7 OPENINGS THROUGH FIRE RATED WALLS & FLOORS NOT REQUIRING FIRE DAMPERS

A. Unless otherwise specified, size holes thru walls in accordance with the through penetration fire stopping system being used.

B. Use through-penetration firestop devices, forming materials, and fill, void or cavity materials to form through-penetration firestops to prevent the passage of flame, smoke, fumes, and hot gasses as detailed in the UL Fire Resistance Directory, Warnock Hersey Certification Listings Book, or the Omega Point Laboratories Listings Directory. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form appropriate through-penetration firestop in accordance with printed details and installation instructions from the Company producing the approved forming materials and fill, void or cavity material.

C. Fill the annular space between the duct and the rated construction (both sides of the rated construction) with a non-hardening, intumescent, UL listed firestop product; and in the absence of manufacturer's firestop system installation instructions or Engineer's recommendation, attach 1½" angles around the perimeter of all ducts (both sides of the rated construction).

D. Firestop through-penetration of floors, walls, partitions, ceilings, and roofs in accordance with the fire resistance rating assigned to the walls, partitions, floors, ceilings, and roofs on the General and Mechanical Construction Drawings.

END OF SECTION 233113

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233300

DUCTWORK ACCESSORIES

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 RELATED WORK SPECIFIED ELSEWHERE

Metal Ductwork: Section 233113
Direct Digital Control System: Section 230923

1.3 REFERENCES

NFPA: National Fire Protection Association.
SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
UL: Underwriters Laboratories, Inc.

1.4 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, diagrams, standard schematic drawings, and installation instructions for each manufactured product. Submit SMACNA Figure Numbers for each shop fabricated item.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Unless otherwise shown or specified, comply with the applicable requirements of the following:

1. SMACNA: Gages of materials, fabrication, sealing, and installation shall be in accordance with the HVAC Duct Construction Standards Manual.

2. NFPA: Standards No.'s 90A, 90B, 91, 96, and 101.

3. UL: Standards No. UL181 and UL555. Use Ul181 for flexible duct; Ul555 for fire dampers.

PART 2 PRODUCTS

2.1 ROUND DUCT TAKE-OFFS / VOLUME DAMPERS

A. Heavy Duty Bell Mouth Take-off: Air tight 24 ga. galvanized (G-90) gasketed bell mouthed, 22 ga. galvanized single blade damper, 3/8" solid bar shaft, indication / operation handle with locking hex nut and Tekline regulator. On insulated ducts, quadrant to be mounted on hat channel; channel height equal to exterior duct insulation thickness. Provide bearings at both ends of operating shaft. (Provide a 45 deg. take-off when the flange diameter of the bell mouth fitting exceeds the height of the duct main. Also provide a 45 deg. take-off were indicated on the drawings.) (Contractor fabricated dampers not acceptable).

B. Volume dampers shall be fitting sized to slip into spiral duct as manufactured by Lindab or equal. Damper shall have the following features (Contractor fabricated dampers not acceptable):

1. Gasketed duct connections compatible with round ductwork system as specified in 233113 Metal Ductwork.
2. Locking quadrant with blade position indicator.
3. 2" sheet metal insulation stand-off.
4. Integral shaft/blade assembly.
5. Shaft mounted, load bearing bushings.
6. Gasketed shaft penetrations to minimize air leakage.

2.2 DAMPERS

A. Volume Control Dampers: Opposed blade type, frames of all welded construction utilizing channel iron members in galvanized steel ducts, extruded members in aluminum ducts and stainless steel in stainless steel ducts. Fabricate frames of 2 inch wide x 1/2 inch legs x 1/8 inch thick (minimum) members for dampers less than 10 sq ft in size and 2 inch wide x 1 inch leg x 1/8 inch thick (minimum) for larger sizes. Fabricate blades from No. 16 gage (minimum) metal, of same material as duct in which installed, with 3 horizontal grooves, 2 turned edges and trunnions mounted in brass sleeve or ball bearings. Space bearings on maximum 48 inch centers. Single blade dampers are unacceptable for ducts over 11 inches in height. Weld motor mounting bracket to damper frame, for pneumatic or electric motor operated dampers.

B. Parallel Blade Dampers: Furnish with 2 inch wide x 1/2 inch leg x 1/8 inch thick metal frames of all welded construction, utilizing channel iron members in steel ducts and extruded aluminum members in aluminum ducts. Fabricate blades from No. 16 gage (minimum) metal, of same material as duct in which installed, with horizontal reinforcing grooves, 2 turned edges and trunnions mounted in bronze sleeve or ball bearings. Single blade dampers are unacceptable for ducts over 11 inches in height. Fabricate dampers of steel for installation in wall openings and for use on discharge side of exhaust fans. Weld motor mounting bracket to damper frame, for pneumatic or electric motor operated dampers. Shop coat raw ferrous parts of damper assemblies with corrosion resistant paint. Dampers used on outside air and exhaust applications shall have stainless steel edge seals and vinyl blade edge seals to for a maximum leakage rating of 20 cfm per sq.ft. of face area at 4" water gauge differential static pressure. Use when dampers are required to be installed in wall openings for outside air inlet or make-up air use and are interlocked with exhaust fans. Avoid product duplication when a temperature control section is included in specifications.

C. Outside air, Relief air and Exhaust air: Dampers used on outside air and exhaust applications shall be insulated with thermally broken frame. Frame and blade edge seals shall be extruded silicone secured in an integral slot within the aluminum frame/blade extrusions and shall be mechanically fastened. Dampers shall be AMCA rated for Leakage Class 1A at 1" water gauge differential static pressure. Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved; Tamco Series 9000 BF, or approved equal.

D. Splitter Dampers: Fabricate dampers of same material as duct in which installed, with rolled or hemmed edges. Provide blades in ducts having a maximum side dimension under 24 inches of same gage as duct, and in ducts having a maximum side dimension 24 inches and over provide blades 2 gages heavier than duct.

E. Fire Dampers; Static Systems:

1. Provide UL 555 Classified and Labeled "Fire Resistance Rating 1-1/2 hr".
2. Fire damper to be Type B, Blades out of the air stream.
3. Frame to be one piece roll-formed 22Ga. galvanized steel.
4. Blades to be 22 Ga. galvanized steel, curtain type.
5. Provide damper with replaceable 165° F. fusible link.
6. Provide with closure springs for both horizontal and vertically installed fire dampers
7. Provide damper with the following options:
    a. Factory supplied sleeves
8. Design Manufacturer: Air Balance, Model 119B.

F. Fire Dampers, Dynamic Systems, Maximum size of 24x24 Horizontal or 36x36 Vertical:

1. Provide UL 555 Classified and Labeled with the following (but not limited to):
    a. Fire Damper, 1-1/2 hr fire resistance rating.
    b. For use in dynamic systems.
    c. Maximum rated air flow and pressure difference across damper.
    d. Directional arrow indicating air flow.
    e. Mounting position (horizontal or vertical, or both).
2. Fire damper to be Type B, Blades out of the air stream.
3. Frame to be one piece roll-formed 22Ga. galvanized steel.
    a. Blades to be 22 Ga. galvanized steel, curtain type.
    b. Provide damper with replaceable 165° F. fusible link.
    c. Provide with closure springs for both horizontal and vertically installed fire dampers

d. Provide damper with the following options:

1) Factory supplied sleeves

e. Design Manufacturer: Air Balance, Model D19B.

G. Manual Damper Regulators:

1. For Dampers Installed in Exposed, or Accessible Concealed Ductwork: Indicating quadrant with heavy metal handle and means for locking damper in all positions. On insulated ducts, quadrant to be mounted on hat channel; channel height equal to exterior duct insulation thickness. Provide bearings at both ends of operating shaft.

2. For Dampers Installed in Inaccessible Concealed Ductwork: Concealed type with indicating regulator in cast metal box with cover plate. Furnish assembly complete with duct and bearing, adjustment coupling, damper extension rods and minimum of 2 keys or socket wrenches for each type of damper adjustment screw or device. On insulated ducts, quadrant to be mounted on hat channel; channel height equal to insulation thickness. Provide bearings at both ends of operating shaft

H. Adjustable Vane Damper Assembly: Factory fabricated assemblies of same material as ductwork in which installed. Design assembly so either half of each blade may be adjusted independently, with blades held in position by friction pins. Install damper unit in collar gasketed with heavy felt. Design assembly to facilitate positive volume control and uniform air distribution over entire outlet.

2.3 TURNING VANE ASSEMBLIES

A. Fabricate vane assemblies of same material as ductwork in which installed. Provide individual hollow airfoil type vanes, rigidly connected to vane rails, with rails welded, screwed, or riveted to the ductwork.

2.4 FLEXIBLE CONNECTIONS - FABRIC

A. Glass fabric coated with an inorganic elastomeric material, similar to Duro Dyne's Thermafab. Use for pressures of 2 inches w.g. or below, and for connections to direct fired heating equipment.

B. Factory pre-fabricated pre-assembled flexible connectors of fabric specified in A. above with minimum No. 24 USS gage metal edges similar to Duro Dyne's Metal-Fab or Super Metal-Fab as required for free fabric length.

2.5 FLEXIBLE DUCT

A. Conform with NFPA 90A, and UL 181, Class I (minimum R-6):

1. Un-insulated: Dual element construction consisting of a corrosion resistant metal support spiral, mechanically locked to reinforced coated glass fabric, conforming to NFPA Standard 90A.

2. Pre-insulated: CertainTeed's Certaflex Punchline 25; Owens-Corning's INL-25; Wiremold WCK.

3. Flexible ductwork installed in unconditioned spaces shall be minimum R-8. Refer to 230713 Duct insulation.

2.6 FLEXIBLE DUCT CLAMP

A. Heavy duty Nylon Tie Anti-slip strap body tie, ribbed and stippled to prevent axial and lateral movement. Natural heat stabilized 6.6 nylon, high tensile strength which meets or exceeds industry and military standards (MIL-S-23190E). Temperature ratings 185 de. F max, -40 deg. F min. Positive grip locking anti-spring back tip: stainless steel (316) barb, infinitely adjustable strap. Shall be installed for a tight secure fit utilizing the manufacturer's installation tool. Manufacturer Panduit or equal.

2.7 DUCT ACCESS DOORS

A. Fabricate minimum 16 x 16 inch size, or duct size by 16" for ducts less than 16" in width, of same material and finish as duct unless otherwise shown or specified.

1. For uninsulated duct designed for under 2 inches w.g.: Fabricate single panel door of same gage as duct, with all edges folded, size door to overlap opening perimeter by one inch.

2. Provide door with a minimum of 4 sash locks, Ventfabrics, Inc. Ventlock No. 260 or Duro Dyne Corp. Code No. SP Series. Sash Locks shall be galvanized, cadmium plated, or aluminized steel or cast aluminum.

3. For insulated duct and duct designed for 2 inches w.g. and over: Fabricate hollow metal doors in accordance with the SMACNA Manual. Fill void in doors for insulated duct with thermally equivalent insulation.

4. Provide doors with a 3/4 inch wide gasket and duct sealer around all 4 sides of duct opening at joint of access door frame and duct.

2.8 PLENUM ACCESS DOORS

A. Fabricate minimum 24" x 36" inch size, of same material and finish as plenum unless otherwise shown. Fabricate doors in accordance with the SMACNA Manual.

B. Door design shall be minimum rating of 4.5" w.g.: Fabricate door frame of .060 aluminum extrusion with 1-1/4" wide flange, double layer door panel of 18 ga. galvanized steel (G-90) with .060 aluminum extrusion frame, fill void in door with 1" thick fiberglass insulation.

C. Provide door with continuous type aluminum hinge.

D. Provide 2 locking door latches: Ventfabrics, Inc., Ventlock No. 260 or Duro Dyne Corp. Code No. SP Series.

E. Provide door with a 3/4 inch wide foam rubber gasket.

F. Provide view port: minimum 8x8 plexiglass window.

2.9 DUCT MOUNTED SMOKE

A. Furnished by electrical contractor. Installed by HVAC contractor. Wired by electrical contractor. Coordinate locations with electrical contractor.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install manual volume control dampers in all branch ducts and take-offs.

C. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.2 TURNING VANES

A. A.Install turning vanes in all rectangular, round and oval square duct construction with 90° elbows and elsewhere as indicated. Small vanes shall be installed in ducts 29" wide and smaller; larger vanes shall be installed in ducts 30" and larger.

3.3 FLEXIBLE FABRIC CONNECTORS (INSTALLATION)

A. Make ductwork connections to air handling equipment with flexible fabric connectors. Install connectors with sufficient slack to prevent vibration transmission.

B. Free Fabric Length: Install fabric connectors a minimum of 3 inches in length for ducts having a maximum diameter of 18 inches, or maximum side dimension of 30 inches, and a minimum of 5 inches in length for duct diameters over 18 inches or side dimensions over 30 inches.

C. Secure fabric connectors to fans, casings and ducts as follows:

1. Secure round connectors with No. 12 USS gage x 1 inch wide galvanized steel draw bands. Secure bands with bolts and nuts.

2. Secure rectangular connectors with 1 inch x 1/8 inch thick flat galvanized steel bars, with screws or bolts on maximum 8 inch centers, or with approved sheet metal slip joints. Tightly crimp fabric into sheet metal joint and secure complete joint with sheet metal screws on maximum 6 inch centers.

D. Fabric connectors may be factory pre-fabricated pre-assembled units, with minimum No. 24 USS gage metal edges, secured to fabric with double lock seams.

E. Do not paint fabric connectors.

3.4 ACCESS DOORS

A. Install gasketed access doors in ductwork for each motor operated damper, manually operated volume control device, smoke damper, fire damper, smoke detector, in duct heating coil and at all locations where operating parts of any kind are installed and require access and elsewhere as indicated. Access doors are not required, where a manually operated damper has an exposed damper regulator, with an indicating quadrant.

B. Install access door accessible to service personnel, providing clear use of the door entire opening, positioned in the ductwork providing servicing of the entire fire damper with-in the duct. Access door shall not be blocked by any obstructions (i.e.: pipe, conduit, other ductwork, etc).

C. Access doors provided to access fire dampers and smoke dampers shall be labeled with 1/2" tall letters (black paint) "FIRE DAMPER". In situations where text does not fit use FD.

3.5 CONCEALED DAMPER REGULATORS

A. Imbed box in, and secure to back-up construction in ceiling or wall, so cover plate is flush with final surface.

3.6 FLEXIBLE DUCT

A. Install flexible duct as per manufacturer's instructions. Provide intermediate support along horizontal runs to avoid excessive sagging. Maximum extended length to be 36".

B. Secure each end of inner fabric of flexible duct to diffuser and ductwork with a flexible duct clamp. Secure each end of outer jacket with a flexible duct clamp independently of inner duct clamp. Nylon or Stainless steel.

3.7 FIELD QUALITY CONTROL

A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

3.8 ADJUSTING AND CLEANING

A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.

B. Label access doors after cleaning in accordance with Division-23 section "Mechanical Identification" and with NFPA 90A.

C. Final positioning of manual dampers is specified in Division-23 section "Testing, Adjusting, and Balancing".

D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.9 EXTRA STOCK

A. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION 233300

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233616

VARIABLE AIR VOLUME UNITS

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 RELATED WORK SPECIFIED ELSEWHERE

Metal Ductwork: Section 233113
Wiring of Mechanical Equipment: Section 230512
Motor Controls: Section 230512
Direct Digital Control System - Electric: Section 230923

1.3 SUBMITTALS

A. Product Data: Catalog cuts, specifications, installation and maintenance instructions for each type of variable air volume specified.

B. Schedule: List manufacturer, unit type, model number, and performance data for each variable air volume box.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Trane Co.
Nailor Industries Inc.
Price Co.

2.2 VARIABLE AIR VOLUME BOXES

A. General: Furnish and install Variable Air Volume Terminal Units, or approved equal, of the size, capacity, and performance as shown on the plans.

B. Performance: The air pressure drop through the terminal units shall not exceed values tabulated on the plans. Sound levels of the terminal units shall not exceed values shown. All performance data shall be tested in accordance with ARI Industry Standard 880-98. Terminal units shall be ARI Certified, rated in accordance with Standard 880-98.

C. Construction: The valve assembly is to be constructed from galvanized steel with the damper mechanically fastened to a d" shaft and isolated from the casing to eliminate the possibility of damper binding due to shipping or handling damage. The damper shaft is to rotate in oil impregnated sintered bronze bearing at three points for support and long life. The control unit, sound attenuator and multi-discharge adaptor casings are to be constructed of 24 gauge galvanized steel. Integral butterfly dampers on multi-discharge units shall be provided for balancing air quantity to remote diffusers.

D. Control Valve: The valve shall be sealed for minimum leakage. The throttling damper shall be of a sandwich design incorporating a solid sheet of Volara®, type A gasket material sandwiched between two halves of reinforced galvanized steel. The average valve leakage shall not exceed 1% at 3" inlet static pressure. Control valves shall be (Normally open)(Normally closed) as required.

E. Insulation: The adaptor insulation shall be ½" thick and have a 4 lb./cu. ft. density outer layer laminated to an inner layer to yield a 1.9 lb./cu. ft. dual density fiberglass liner. The insulation for the model AXAB sound attenuator shall be a 2" thick, 1½ lb./cu/ ft. homogeneous density fiberglass material. The surface of the insulation for all units shall conform to UL Test 181 for erosion resistance. The insulation must be UL listed and meet NFPA 90A requirements for 250°F continuous temperature.

F. Foil Coated Insulation: The foil faced insulation shall be ½" thick, dual density fiberglass with a 0.001" aluminum foil on the matted face. The insulation must be UL listed conforming to the UL Test 181 for erosion resistance and must meet NFPA 90A requirements for 250°F continuous temperature. The edges of the insulation must be sealed so that there is no exposed fiberglass material in the airstream.

G. Electric Control: Individual 24 volt motors shall be provided for forward and reverse operation. The actuator assembly shall be direct drive mounted on the damper shaft. Valve action shall require approximately 6 from extreme positions. The electric actuator assembly shall be used in conjunction with the rapid response thermostat with forward, null and reverse positions to prevent hunting.

H. Provide pressure independent electric volume control with field adjustable maximum and minimum stops. Control action shall be direct drive to open and direct drive to close. Air volumes must be field set.

I. Balancing: Terminal units shall have flow taps and calibration chart for the purpose of measuring air flow.

J. Accessories: Air flow sensor in inlet, hanger brackets.

2.3 CONSTANT VOLUME AIRFLOW VALVE

A. The airflow control device shall be a Phoenix Controls Accel II pressure independent venturi valve.

B. The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2015.

C. Airflow control device shall be OSHPD tested and certified per 2013 CBC, 2012, IBC, ASCE 7-10, and ICC-ES-AC-156.

D. All Components of the valve, its controllers, and wiring shall be ROHS compliant.

E. The airflow control device shall be mechanically pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change (within product specifications) or quantity of airflow controllers on a manifolded system.

F. The airflow control device shall maintain accuracy within ±5% of signal to set point over an airflow turndown range of no less than:

1. 7 to 1 (low pressure all valve sizes)

2. 11 to 1 (low pressure w/o 14" valve)

G. No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.

H. No rotational/axial orientation requirements shall be required to ensure accuracy and/or pressure independence.

I. The airflow control device shall maintain pressure independence regardless of loss of power. "Electronically pressure independent" devices will not be acceptable.

J. Airflow control devices utilizing ASHRAE 130 minimum operating pressure as a rating for minimum design pressure at required flow will not be acceptable on basis on minimum operating pressure alone. Valve manufacturer will provide minimum required differential pressure in writing for each size valve they offer.

K. The airflow control device shall be constructed in the following type:

1. Class A—The airflow control device for non-corrosive airstreams, such as supply and general exhaust, shall be constructed of 16-gauge aluminum. The device's shaft and internal "S" link shall be made of 316 stainless steel. The shaft support brackets shall be made of galvaneal (non-shutoff valves) or 316 stainless steel (shutoff valves). The pivot arm shall be made of aluminum (for non-shutoff valves) and 303/304 stainless (for shutoff valves). The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a PP (polypropylene) or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.

2.4 CONSTANT VOLUME AIRFLOW CONTROL DEVICE

A. The airflow control device shall maintain a constant airflow set point. It shall be factory characterized and set for the desired airflow. It shall also be capable of field adjustment for future changes in desired airflow.

B. Constant volume valves must be 100% mechanically pressure independent, and require no actuation to maintain set point.

C. Constant volume valves shall have no required electronics to maintain set point.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install variable air volume boxes and constant volume airflow control devices in complete accordance with the manufacturer's printed installation instructions and the requirements of the Contract Documents.

END OF SECTION 233616

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Metal Ductwork: Section 233113

1.3 REFERENCES

NFPA: National Fire Protection Association.
SMACNA: Sheet Metal and Air Conditioning (Sub)Contractors National Association, Inc.
UL: Underwriters Laboratories, Inc.

1.4 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, diagrams, standard schematic drawings, and installation instructions for each manufactured product. Submit SMACNA Figure Numbers for each shop fabricated item.

B. Provide a room schedule, to include: listing of all rooms (room name or number), equipment identification tag, CFM, face and inlet neck size, quantity required and corresponding manufacturers' model number.

C. Samples: When requested by the Engineer, submit one complete unit for each type of proposed air inlet and outlet device. Approved samples will be delivered to the job site for installation.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Unless otherwise shown or specified, comply with the applicable requirements of the following:

   a. SMACNA: Gages of materials, fabrication, sealing, and installation shall be in accordance with the HVAC Duct Construction Standards Manual.

   b. NFPA: Standards No.'s 90A, 90B, 91, 96, and 101.

   c. UL: Standards No. UL555.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Nailor Industries, Inc.
Carnes
Metalaire
Titus
Tuttle

2.2 GRILLES AND REGISTERS

A. Fabricate grille and register faces, and frames installed in shower rooms, locker rooms, toilet rooms, can washing, dishwasher, food serving, and kitchens of aluminum with an etched and acrylic coated finish.

B. Unless otherwise specified, fabricate all other grille and register faces, and frames of steel with factory applied finish as follows:

1. Prime coat for installation in walls and gypsum board, hard plaster or acoustic plaster ceilings specified to be painted.

2. Baked-on white enamel for installation in splined acoustic ceilings, metal pan ceilings and suspended lay-in tile ceilings.

C. Provide frames for each grille and register except as follows:

1. Grilles and registers installed directly in exposed uninsulated ductwork.

2. Grilles or registers designed for installation in suspended lay-in tile ceilings or suspended combination lay-in and splined tile grid ceilings.

3. Grilles or registers installed in gypsum board walls or ceilings.

4. Grilles or registers installed in metal pan ceilings.

D. Exhaust or Return Grilles: Fixed 40 degree or 45 degree single deflection type, consisting of a heavy formed face with face bars on nominal 0.66 inch or 0.75 inch centers, installed in a No. 20 gage frame of same material as bars.

1. Sidewall grilles shall have horizontal face bars.

E. Supply Registers:

1. Face: Adjustable double deflection type, consisting of a heavy formed face, with rear bars or vanes installed in a No. 20 gage frame, of same material as bars or vanes, with face and rear bars or vanes on nominal 0.66 inch or 0.75 inch centers; individually adjustable and front pivoting to any desired setting, by means of a key. Furnish one adjustment key per every 5 registers.

2. Damper Assembly: Opposed multi-blade type, consisting of frame, blades, and key operated movement of the locking type, with operator projecting through frame. Furnish operators which are removable or permanently secured in place, as directed. Fabricate damper assemblies for use with aluminum or stainless steel register faces of aluminum with an etched or acrylic coated finish, and for use with factory painted register faces, or equivalent finish as approved by the Engineer.

F. Exhaust or Return Registers:

1. Face: Fixed 40 degree or 45 degree fixed single deflection type, consisting of a heavy formed face with face bars on nominal 0.66 inch or 0.75 inch centers, installed in a No. 20 gage frame, of same material as bars.

a. Sidewall registers shall have horizontal face bars.

2. Damper Assembly: Opposed multi-blade type, consisting of frame, blades and key operated movement of the locking type, with operator projecting through frame. Furnish operators which are removable or permanently secured in place, as directed. Fabricate damper assemblies for use with aluminum or stainless steel register faces of aluminum with an etched or acrylic coated finish, and for use with factory painted register faces, or equivalent finish acceptable to the Engineer.

G. Linear Return Register:

1. Extruded aluminum linear grille, 3" wide with c" blades on ¼" centers in extruded aluminum frame with 1" flange. Grille shall be designed for installation in a sidewall application with spring-clip retainers. Blades shall be designed for 0E deflection. Finish to be brushed aluminum.

2. Damper Assembly: Opposed multi-blade type, consisting of frame, blades and key operated movement of the locking type, with operator projecting through frame. Furnish operators which are removable or permanently secured in place, as directed. Fabricate damper assemblies for use with aluminum or stainless steel register faces of aluminum with an etched or acrylic coated finish, and for use with factory painted register faces, or equivalent finish as approved by the Engineer.

H. Frames for Registers and Grilles:

1. Fabricated from a minimum of No. 20 USS gage stamped or rolled steel, or extruded aluminum, to match material and finish of mating grille or register face. Exposed joints shall be welded and ground flush, or corner joints completely closed with neatly welded backtrim. Furnish frames complete with felt or sponge rubber gaskets on all four sides, except when frames are used as plaster stops.

2.3 AIR DIFFUSERS

A. Square, rectangular or linear type as indicated. Do not use neck or duct connection sizes indicated to size diffusers.

B. Furnish aluminum diffusers with an etched and clear acrylic coated finish where installed in shower, toilet rooms, locker rooms, dishwasher, food serving and kitchens.

C. In general, fabricate diffusers of steel with a white baked enamel finish, or aluminum with an etched and clear acrylic coated finish, unless otherwise specified. Roll or round and reinforce all exposed edges of diffusers and provide readily removable internal diffuser parts to permit cleaning and access to ducts. Design removable parts and assemblies so that they cannot be reassembled in a manner which would produce an incorrect air distribution pattern. Secure internal assemblies with fasteners, which will allow their removal without use of special tools.

D. Circular, Square and Rectangular Diffusers: Complete with volume control damper (and adjustable equalizing grid), fabricated of same material as diffuser. Damper shall be adjustable by means of operator handle and rod device, which is designed to be locked in any position. Diffusers installed in plaster ceilings shall have plaster grounds and anti-smudge rings of same material and finish as diffuser, or diffuser shall have specially designed outer rings or rims with contours of sufficient depth below ceiling line to minimize smudging.

E. Linear Diffusers: Complete with air flow and pattern control valve, adjustable to any desired setting, fabricated of same material and with same finish as diffuser.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Unless otherwise shown or specified, install the Work of this section in accordance with the manufacturer's printed installation instructions and the SMACNA Manual.

B. Ductwork seen behind registers, in other words; ductwork visible through a register (inside the duct) shall be painted using one coat of flat black metal paint (after proper surface cleaning). Paint coverage shall be that no unpainted duct will be seen. This applies to all grilles, registers and diffusers.

END OF SECTION 233713

SECTION 233723

ROOF VENTILATORS

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 RELATED WORK SPECIFIED ELSEWHERE

Metal Ductwork: Section 233113
Duct Accessories: Section 233300

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, standard schematic drawings, specifications and installation instructions for each size unit and curb.

PART 2 PRODUCTS

2.1 OUTSIDE AIR INTAKES

A. Design: Outside air intakes shall be of sectional construction consisting of a base section and a top section or cover. Top section shall be hinged or easily removable for access to inside of base section and curb.

B. Fabrication: Fabricate intakes from a heavy gage aluminum, properly braced and stiffened to form a rigid stormproof unit, which will withstand a minimum horizontal pressure of 30 lbs. per square foot of projected area. Provide 1/2" insulation on underside of hood to prevent condensation. Fabricate all hinges, friction catches and other fastening devices from corrosion resistant material, as approved. Intakes and relief openings shall be provided with aluminum (insect-bird) screens. Basic housing materials for the different styles of intakes and vents are as follows:

1. Standard (Low contour rectangular shaped): Sheet aluminum.

2.2 ROOF CURBS

A. Fabrication: Factory fabricated, double shell aluminum, a minimum of 2" thick, insulated with mineral wool, or thermally equivalent insulation as approved. Fabricate curbs from minimum No. l8 gage aluminum, properly braced and stiffened to form a rigid weatherproof unit.

B. Manufacture: Curbs shall be the product of the ventilator manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Preliminary Work: Deliver curbs to Construction (Sub)Contractor for installation. Coordinate with the Construction (Sub)Contractor in the locating and sizing of all roof openings required.

B. Secure air intakes to roof curbs, with approved fastening devices.

END OF SECTION 233723

SECTION 233730

LOUVERS

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 RELATED WORK SPECIFIED ELSEWHERE

Metal Ductwork: Section 233113

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication details of Louvers.

B. Product Data: Manufacturer's catalog sheets, performance charts, test data, specifications and installation instructions for each.

1.4 GENERAL

A. AMCA Test Standard: For louvers with specified air performance, water penetration, and air leakage ratings, provide units whose ratings have been determined in compliance with AMCA Standard 511.

B. Structural Performance: Design, engineer, fabricate and install units capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of components, metal fatigue or noise from louver blade rattle or flutter and permanent damage to fasteners or anchors.

1. Wind Load: Uniform pressure of 30 lbf per sq. ft. acting inward and outward.

2. Normal thermal movement from ambient temperature change (range) of 100E F (55.5E C) and its effect on metal surfaces due to both solar heat gain and night time sky heat loss.

C. Field Measurements: Verify size, location and placement of louver units prior to fabrication.

D. Preassemble units in shop to greatest extent possible.

PART 2 PRODUCTS

2.1 LOUVERS

A. American Warming and Ventilating, LE-23; or acceptable equal.

B. Kynar Finish: Color selection by Architect. Colors to be selected from Manufacturer's full range of color selections.

C. Materials:

1. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T52, 0.081" minimum section.

2. Fasteners: Noncorrosive and compatible with materials joined. For aluminum, use aluminum or 300 series stainless-steel fasteners.

D. Fabrication, General: Fabricate louvers and accessories to comply with requirements indicated for design (blade angle, blade profile, blade spacing), metal type and form, sizes, depth, arrangement and metal thicknesses indicated or required for performance and use intended.

1. Fabricate frames, including sills, to suit adjacent construction, with mullions at spacing indicated but no further apart than recommended by manufacturer.

2. Join frame members to one another and to blades with fillet welds, concealed from view; or mechanical fasteners; or both, as standard with louver manufacturer.

E. Horizontal drainable fixed blade louvers with gutters in front edges of blades and channels in jambs and mullions for drainage, complying with the following requirements.

1. Performance rated as follows for 48 inch square unit and marked with the AMCA Certified Ratings Seal:

a. Louver Free Area: Not less than 8.9 sq. ft.

b. Static Pressure Loss: Not more than 0.13 inch water gage at an airflow at 1009 fpm free area velocity.

c. Water Penetration: 0.01 oz. per sq. ft. of free area at an airflow of 1009 fpm free area when tested for 15 minutes.

F. Louver Screens: On interior face of exterior louvers, provide louver screens complying with the following requirements:

1. Frames: Of same metal and finish as louvers to which frames are attached, and of the rewireable type with driven spline or insert for securing screen mesh.

2. Louver Screening for Aluminum Louvers: 1/2" square mesh bird screening, 0.063 inch diameter aluminum wire.

PART 3 EXECUTION

3.1 EXECUTION

A. Deliver louvers to Construction (Sub)Contractor for installation.

END OF SECTION 233730

SECTION 235413

ELECTRIC CABINET HEATERS

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 RELATED WORK SPECIFIED ELSEWHERE

Wiring of Mechanical Equipment: Section 230512
Heating Motor Controls: Section 230512
Direct Digital Control System: Section 230923

1.3 REFERENCES

AMCA and ARI standards.
UL listed.

1.4 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, standard schematic drawings, specifications and installation instruction for each size unit and curb.

B. Contract Closeout Submittals:

1. Operation and Maintenance Data: Submit 2 copies to the Engineer, incorporated within maintenance manuals, covering the installed products.

1.5 MAINTENANCE

A. Spare Parts: Two complete sets of filters for each heater; packaged and labeled as to their usage.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Chromalox
Markel
Q'Mark

2.2 ELECTRIC HEATERS

A. Cabinet: Provide a minimum No. 16 gage sheet steel cabinet, formed, reinforced and braced for rigidity, complete with inlet and outlet grilles, located as indicated. Provide filter frame with filters directly behind air inlet grille, or directly under fan assembly.

B. Heating Elements: Provide unitary chrome-nickel finned strip elements, each encased in a heavy gage galvanized or aluminized steel enclosure. Furnish elements of the enclosed, non-glowing type. Totally enclose elements, to prevent contact with live electrical parts or accessories.

C. Fan Assembly: Provide steel or non-ferrous, multi-blade, forward curved centrifugal type fans, statically and dynamically balanced, direct or Vee belt connected to a resiliently mounted electric motor. Design motors to operate on 120 volt, 60 cycle, 1 phase service.

D. Controllers: Provide a manually operated on-off switch for single speed units, and a speed selector switch with off position for multi-speed units. Mount all controllers on unit casings or remotely, as indicated.

E. Accessories: Furnish each unit complete with all internal wiring in conduit, a safety disconnect switch, an automatic reset high limit switch, wired in series with all heating elements located in the discharge air-stream, and a fan switch wired to allow the fan to operate after heater shut-down to dissipate all heat. Furnish control transformer installed inside casing, when heater voltage differs from motor voltage and provide terminal strip for remote wall mounted thermostat.

F. Factory Finish: Furnish all exposed surfaces of heaters, with a factory applied two coat baked enamel finish. Colors shall be as selected by the Architect/Engineer from the heater manufacturer's standard color charts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install heaters at locations indicated on drawings.

1. Wall Mounted Type: Secure to wall construction as required and directed.

3.2 CONTROL

A. Install wall mounted low voltage thermostat as indicated on drawings or as directed.

END OF SECTION 235413

SECTION 235415

ELECTRIC UNIT HEATERS

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 RELATED WORK SPECIFIED ELSEWHERE

Wiring of Mechanical Equipment: Section 230512
Motor Controls: Section 230512

1.3 REFERENCES

A. Rate heaters in accordance with AMCA and ARI standards.

B. All electrical components shall be UL listed.

1.4 SUBMITTALS

A. Product Data: Catalog sheets, performance charts, specifications and installation instructions.

PART 2 PRODUCTS

2.1 ELECTRIC HEATERS

A. Casing: Provide heavy gage die stamped sheet steel casing, formed, reinforced and braced for rigidity. Furnish horizontal units with adjustable horizontal and vertical louvers, and vertical units with a radial deflector with adjustable multiple blades mounted in a cone, outside fan orifice. Fabricate louvers and deflector from sheet steel of sufficient rigidity to prevent vibration at all speeds.

B. Heating Elements: Provide black-heat, finned steel-sheathed type, of spiral design, individually replaceable. Furnish elements complete with built-in thermal cutouts, for protection against overheating. Furnish control transformer installed withing casing and provide terminal strip for remote mounted thermostat.

C. Fan Assembly: Provide multiple blade propeller type, directly connected to a resiliently mounted electric motor, of speed or speeds as indicated. Furnish single phase motors of the capacitor, split phase or shaded pole type. Furnish assembly complete with terminal box for wiring connections and a UL approved disconnect switch mounted on heater.

D. Factory Finish: Furnish all exposed surfaces of unit heaters, with a factory applied two coat baked enamel finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install heaters at locations indicated on drawings.

B. Support heaters from overhead construction by means of steel hanger rods, a minimum of 2 per heater, unless otherwise indicated.

3.2 CONTROL

A. Thermostatically controlled.

END OF SECTION 235415

SECTION 237313

INDOOR AIR HANDLING UNITS

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. This section includes the design, controls, and installation requirements for indoor air handling units.

1.2 QUALITY ASSURANCE

A. Unit shall be certified in accordance with UL Standard 60335-2-40 and CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL label.

1.3 SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided. Run test report shall be supplied with the unit in the control compartment's literature packet, and also available electronically after the unit ships.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, clearances, and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with detail for power and control systems and differentiate between factory installed and field installed wiring.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be on a wooden pallet with skeleton crating prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be handled carefully to avoid damage to components, enclosures and finish.

D. Unit shall be stored in a clean, dry place protected from weather and construction traffic in accordance with Installation, Operation and Maintenance manual instructions.

1.5 WARRANTY

A. Manufacturer shall provide a limited "parts only" warranty for a period of 12 months from the date of equipment start up or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON or approved equal.
2. Substitute equipment may be considered for approval that includes at a minimum:
   a. VFD driven direct drive backward curved plenum supply fans
   b. Double wall cabinet construction
   c. Insulation with a minimum R-value of 6.25
   d. Double-sloped stainless steel drain pans
   e. Hinged access doors with lockable handles
   f. LED service lights in the control panel
   g. Designed, engineered, and manufactured in the United States of America
   h. All other provisions of the specifications must be satisfactorily addressed

2.2 AIR HANDLING UNITS

A. General Description

1. Indoor air handling units shall include filters, supply fans, and the following:
   a. 40% PG chilled water coil
   b. 40% PG hot water coil
   c. exhaust fans & energy recovery wheel
   d. low voltage terminal block for field installed controls by others
2. Unit shall have a draw-through supply fan configuration and discharge air horizontally.
3. Unit shall be shipped in three sections and factory tested including leak testing of the coils and run testing of the supply fans and factory wired system. Run test report shall be supplied with the unit in the control compartment's literature packet, and also available electronically after the unit ships.
4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

5. Unit components shall be labeled, including pipe stub outs, electrical and controls components.
6. Installation, Operation and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam injected panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, reduces heat transfer through the panel and prevents exterior condensation on the panel.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Access doors shall be flush mounted to cabinetry.
6. Units shall include double-sloped 304 stainless steel drain pan. Drain pan connection shall be on the right hand side of unit with a 1" MPT fitting.
7. Cooling coil shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.
8. Unit shall include factory wired control panel compartment LED service lights.
9. Unit shall include exterior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

C. Electrical

1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Both side walls of the control panel shall include louvered vents. Control panel shall be field mounted and shall include a piano hinged service access door with tooled entry.
2. Unit shall be provided with standard power block for connecting power to the unit.
3. Unit shall include a factory installed 24V control circuit transformer.
4. Unit shall have a 5kAIC SCCR.

5. Unit shall include high and low voltage quick connects for easy wiring at installation.

6. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

2. Blower and motor assembly shall be dynamically balanced.

3. Motor shall be IE5 efficiency permanent magnet totally enclosed motor. Variable frequency drive shall be factory wired and mounted in the unit.

4. Blower and motor assembly shall utilize neoprene gasket.

E. Exhaust Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum exhaust fans.

2. Blower and motor assembly shall be dynamically balanced.

3. Motor shall be a high efficiency electronically commutated motor (ECM).

4. Blower and motor assembly shall utilize neoprene gasket.

5. Access to exhaust fan shall be through piano hinged access door with handle and prop rods. The access door shall be secured shut with two bolts that must be removed.

6. Access to exhaust fan shall be through removable pin hinges access door with handle and prop rods. The access door shall be secured shut with two bolts that must be removed. The factory provided terminal block shall include a jumper wire that can be removed when wired to field provided 0-10 VDC control signal.

7. Access to exhaust fan shall be through piano hinged access door with handle and prop rods. The access door shall be secured shut with two bolts that must be removed.

F. Cooling Coil

1. Access to cooling coil shall be through hinged access door with lockable quarter turn handles.

2. Chilled Water Cooling Coil

a. Coil shall be certified in accordance with AHRI Standard 410 and be hydrogen leak tested.

b. Coil shall be designed and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

c. Coil shall have single serpentine circuitry, 8 rows and 12 fins per inch.

d. Coil shall have right hand external piping connections. Supply and return connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing, and be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

e. Control valves shall be field supplied and field installed.

G. Heating Coil

1. Access to heating coil shall be through hinged access door with lockable quarter turn handles.

2. Hot Water Heating Coil

a. Coil shall be certified in accordance with AHRI Standard 410 and be hydrogen leak tested.

b. Coil shall be designed and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

c. Coil shall have half serpentine circuitry, 1 row and 8 fins per inch.

d. Coil shall have right hand external piping connections. Supply and return connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing, and be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

e. Control valves shall be field supplied and field installed.

f. Coils shall be located in the preheat position upstream of the cooling coil.

H. Filters

1. Unit filter access shall be through service access door with piano hinges and draw latches.

2. Unit shall include 4 inch thick, pleated panel filters with a MERV rating of 14, upstream of the cooling coil. Unit shall also include 2 inch thick, pleated panel pre filters with MERV rating of 8, upstream of the 4 inch standard filters.

3. Return air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a 2 position actuator.

4. Outside air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a 2 position actuator.

I. Energy Recovery

1. Unit shall contain an energy recovery cabinet with back outside air and exhaust air opening, access side return air opening, and front supply air opening.

2. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a fully modulating actuator.

3. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.

4. Wheel frame shall slide out for service and removal from the cabinet.

5. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.

6. Wheels shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.

7. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.

8. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

9. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

10. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.

11. Unit shall include 2 inch thick, pleated panel outside air filters with MERV rating of 8, upstream of the wheels.

12. Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

13. Unit shall include a clogged filter switch that senses pressure drop across the outside air filters and energy recovery wheel.

14. Access to energy recovery wheel, exhaust fan, outside air dampers, and economizer dampers shall be through hinged access door with handle and prop rods. The access door is secured shut with two bolts that must be removed. To access the outside air filters, the triangular sheet metal panel under the energy recovery wheel must first be removed by removing the two bolts. The outside air filters can then be accessed through interlocking sheet metal cover with quarter turn button fasteners. Access to return air filters shall be through removable interlocking sheet metal cover with quarter turn button fasteners on the top and side

J. Controls

1. Unit shall be provided with a proof of airflow switch. When airflow is not detected, other electrical components cannot power on.

2. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.

3. Access to external control panel shall be through hinged access door with tooled entry.

4. Field Installed DDC Controls by Others

a. Controls shall be field provided and field installed by others. Unit shall be provided with a terminal block and a supply air setpoint potentiometer.

PART 3 EXECUTION

3.1 INSTALLATION, OPERATION AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

END OF SECTION 237313

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 238124

AIR CONDITIONERS – COMPUTER ROOM

PART 1 GENERAL

1.1 SUMMARY

A. These specifications describe requirements for a Thermal Management system. The system shall be designed to control temperature and humidity conditions in rooms containing electronic equipment, with good insulation and vapor barrier. The manufacturer shall design and furnish all equipment to be fully compatible with heat-dissipation requirements of the room.

1.2 DESIGN REQUIREMENTS

A. The Thermal Management system shall be a Liebert self-contained, factory-assembled unit. Standard 60 Hz units shall be CSA-certified to the harmonized U.S. and Canadian product safety standard, "CSA C22.2 No 236/UL 1995 for Heating and Cooling Equipment" and are marked with the CSA c-us logo.

B. The system shall be AHRI Certified™, the trusted mark of performance assurance for heating, ventilation, air conditioning and commercial refrigeration equipment, using AHRI Standard 1360.

1.3 SUBMITTALS

A. Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity Data; Piping and Electrical Connection Drawings.

1.4 SERVICEABILITY/ACCESS

A. The cabinet shall be designed so that all components are easily accessible for service and maintenance through the front of the unit.

1.5 ACCEPTABLE ALTERNATIVES

A. With prior engineer's approval only. Contractor to submit a detailed summary form listing all variations to include size deviations, electrical load differences, functional and component changes and savings to end user.

1.6 QUALITY ASSURANCE

A. The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "Hi-Pot." The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

PART 2 PRODUCTS

2.1 FRAME

A. The frame shall be welded, formed sheet metal. It shall be protected against corrosion using the autophoretic coating process. The frame shall be capable of being separated into three parts in the field to accommodate rigging through small spaces.

1. Downflow Air-flow Configurations

a. Downflow Air, Under-floor discharge

1) The supply air shall exit from the bottom of the unit.

2. Exterior Panels

a. The exterior panels shall be insulated with a minimum 1 in. (25 mm), 1.5 lb. (0.68 kg) density fiber insulation. The main front panel shall have captive quarter-turn fasteners.

2.2 FILTERS

A. For Downflow units, the filter chamber shall be located within the cabinet, and filters shall be removable from the top of the unit. Filters shall be arranged in a flat bank configuration.

1. Filters, 4-in. MERV8

a. Filters shall be deep pleated 4-in. filters with an ASHRAE 52.2-2007 MERV8 or ASHRAE 52.2-2007 MERV11.

2. Extra Filter Set

a. 1 extra set of filters shall be provided per system.

2.3 LOCKING DISCONNECT SWITCH

A. The manual disconnect switch shall be mounted in the high-voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the door closed, and shall prevent access to the high-voltage electrical components until switched to the "OFF" position.

2.4 SHORT-CIRCUIT CURRENT RATING (SCCR)

A. The electrical panel shall provide at least 65,000A SCCR (60hz) or 5000A SCCR (50 Hz).

B. Short-circuit current rating (SCCR) is the maximum short-circuit current a component or assembly can safely withstand when protected by a specific overcurrent protective device(s) or for a specified time.

2.5 FAN SECTION

A. Electronically Commutated (EC) Fan

1. The blower section shall be designed for 8000 CFM at an external static pressure of .2in. wg. (Pa).

2. The fans shall be plug/plenum type, single inlet and shall be dynamically balanced. The drive package shall be direct drive, electronically commutated and variable speed. The fans shall be located to draw air over the coil to ensure even air distribution and maximum coil performance.

a. DS053 fan motors shall be nominal 4.0 hp (3.0 kW) each with a maximum operating speed of 1520 rpm; quantity, 2.

2.6 INFRARED HUMIDIFIER

A. A humidifier shall be factory-installed inside the unit. Bypass air slots shall be included to enable moisture to be absorbed into the air stream. The humidifier shall be of the infrared type, consisting of high-intensity quartz lamps mounted above and out-of the water supply. The humidifier pan shall be stainless steel and arranged to be removable without disconnecting high-voltage electrical connections. The complete humidifier section shall be pre-piped, ready for field connection to the water supply. The humidifier shall be equipped with an automatic water-supply system and shall have an adjustable water-overfeed to prevent mineral precipitation. A high-water detector shall shut-down the humidifier to prevent overflowing. A 1 in. (24 mm) air-gap in compliance with ASME A112.1.2 section 2.4.2 (backsiphonage testing) shall prevent back-flow of the humidifier supply water. The humidifier capacity shall be22lb./hr. The humidifier shall be removable from the front of the cabinet.

2.7 THREE-STAGE REHEAT

A. The Thermal Management unit shall include a factory-installed reheat to control temperature during dehumidification.

B. The electric reheat coils shall be low watt density, 304/304 stainless steel fin tubular construction, protected by thermal safety switches, shall be 85.3 kBTUH controlled in three stages. The reheat elements shall be removable from the front of the cabinet.

2.8 REFRIGERATION SYSTEM

A. EVAPORATOR COIL

1. The evaporator coil shall be A-frame design for downflow units and have 24.2 sq. ft. face area, 3 rows deep.

2. It shall be constructed of rifled copper tubes and aluminum fins A stainless-steel condensate drain pan shall be provided.

B. COMPRESSORIZED SYSTEMS

1. DUAL REFRIGERATION SYSTEM

a. Each unit shall include two (2) independent refrigeration circuits and shall include hot gas mufflers (semi-hermetic compressor units only), liquid line filter driers, and refrigerant sight glasses with moisture indicator, externally equalized expansion valves, and liquid line solenoid valves. Compressors shall be located outside the air stream and shall be removable and serviceable from the front of the unit

2. DIGITAL SCROLL COMPRESSORS

a. The compressor shall be scroll-type with a variable capacity operation capability. The compressor solenoid valve shall unload the compressor and allow for variable capacity operation. The compressor shall be suction gas cooled motor, vibration isolators, thermal overloads, automatic reset high-pressure switch with lockout after three failures, rotalock service valves, pump-down low-pressure transducer, suction-line strainer and a maximum operating speed of 3500 rpm. Consult factory for 575V availability. Not available on DS077 and DS105 units.

C. EXPANSION VALVE

1. Thermostatic Expansion Valve (TXV)

a. A manual adjustable externally equalized expansion valve thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

D. CRANKCASE HEATERS

1. The compressors shall include crankcase heaters, powered from the indoor unit electric panel.

E. R-407C REFRIGERANT

1. The system shall be designed for use with R-407C refrigerant, which meets the EPA clean air act for phase-out of HCFC refrigerants.

2.9 COOLING SYSTEM

A. AIR-COOLED SYSTEM

1. SYSTEM DESCRIPTION

a. The indoor evaporator refrigerant piping shall be filled with an inert gas holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system. Evaporator unit shall be matched with a Liebert MC condenser.

2.10 LIEBERT ICOM™
MICROPROCESSOR CONTROL WITH 9-INCH COLOR TOUCHSCREEN

A. The Liebert iCOM shall be microprocessor-based with a 9-in. color touchscreen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The display and housing shall be viewable while the front panel is open or closed. The controls shall be menu-driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards and diagnostics/service mode.

1. Password Protection - The Liebert iCOM shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.

2. Unit Backup/Restore - The Backup function saves a copy of the settings in a file based on the system name assigned during startup. The backup can be used to restore only the unit where it was created and serve as a recovery if a display fails. The backup file includes network settings, the unit name, panel configuration and other details specific to the Liebert iCOM display. The Restore function copies the backup settings file to a Liebert iCOM/display so that it functions exactly as it did before the unwanted change or as it did on the Liebert iCOM that was replaced.

3. Unit Export/Import - The Export function makes a copy of the settings from the Liebert iCOM display that may be stored on a local disk or USB drive. The settings may be imported to a second Liebert iCOM, resulting in two systems with identical display properties. The Liebert iCOM will automatically recognize USB drives and display them in the relevant screens. Multiple backup files may be put on the same USB drive as long as each system name is unique. The Import function allows previously exported settings files to be loaded to a second Liebert iCOM. This allows display settings, including panel configurations and custom labels, to be copied from one display to another.

4. Parameter Download - The Liebert iCOM shall enable the user to download a report that lists parameter names, factory default settings and user programmed settings in .csv format for remote reference.

5. Parameter Search - The Liebert iCOM shall have search fields for efficient navigation and parameter lookup.

6. Parameter Directory - The Liebert iCOM shall provide a directory that lists all parameters in the control. The list shall provide Line ID numbers, parameter labels, and current parameter values.

7. Setup Wizards - The Liebert iCOM shall contain step-by-step tutorials or wizards to provide easy setup of the control.

8. Context-Sensitive Help - The Liebert iCOM shall have an on-board help database. The database shall provide context-sensitive help to assist with setup and navigation of the menus.

9. Display Setup - The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back-light timer and the hide/show of certain readouts shall be configurable through the display.

10. Additional Readouts - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free-cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.

11. Status LED's - The Liebert iCOM shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.

12. Event Log - The Liebert iCOM shall automatically store the last 400 unit-only events (messages, warnings, and alarms).

13. Service Contact Information - The Liebert iCOM shall be able to store the local service or sales contact information.

14. Upgradeable - Liebert iCOM upgrades shall be performed through a USB connection.

15. Timers/Sleep Mode – The menus shall allow various customer settings for turning the unit On or Off.

16. Menu Layout - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be designed for service personnel and shall provide access to advanced control setup features and diagnostic information.

17. Sensor Calibration - The menus shall allow unit sensors to be calibrated with external sensors.

18. Maintenance/Wellness Settings - The menus shall allow reporting of potential component problems before they occur.

19. Options Setup - The menus shall provide operation settings for the installed components.

20. Auxiliary Boards - The menus shall allow setup of optional expansion boards.

21. Various Sensors - The menus shall allow setup and display of optional custom sensors. The control shall include four customer-accessible analog inputs for sensors provided by others. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display. When configuring the analog inputs, the selectable items to choose from shall include air pressure, fluid pressure, temperature, percentage, general amperage, condenser amps, compressor amps, reheat amps, humidifier amps, unit amps, fan amps factory standard, and not used.

22. Diagnostics/Service Mode - The Liebert iCOM control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

2.11 ALARMS

A. All unit alarms shall be annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log and communicated to the customers Building Management System/Building Automation System. The Liebert iCOM control shall activate an audible and visual alarm in event of any of the following conditions:

1. High Temperature
2. Low Temperature
3. High Humidity
4. Low Humidity
5. EC Fan Fault
6. Change Filters
7. Loss of Air Flow
8. Loss of Power
9. Compressor Overload (Optional)
10. Humidifier Problem
11. High Head Pressure
12. Low Suction Pressure
13. Custom Alarms

B. Custom alarm inputs shall be provided to indicate facility-specific events. Custom alarms can be identified with programmable labels. Frequently used alarm inputs include:

1. Leak Under Floor
2. Smoke Detected
3. Standby Unit On

C. Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm and programmed for a time delay of 0 to 255 seconds.

2.12 LIEBERT ICOM™ CONTROL METHODS AND OPTIONS

A. The Liebert iCOM shall be factory-set to allow precise monitoring and control of the condition of the air entering and leaving the unit. This control shall include predictive methods to control air flow and cooling capacity based control sensors installed. Proportional and Tunable PID shall also be user-selectable options.

1. Controlling Sensor Options

a. Liebert iCOM shall be flexible in the sense that it shall allow for controlling the capacity and fan from multiple different sensor selections. The sensor selections shall be:

1) Cooling Capacity

a) Supply

b) Remote

c) Return

2) Fan Speed

d) Supply

e) Remote

f) Return

g) Manual (for diagnostic or to receive a signal from the BMS through the Liebert remote monitoring devices or analog input)

h) Static Pressure

2. Temperature Compensation

a. The Liebert iCOM shall be able to adjust the capacity output based on supply and return temperature conditions to meet SLA guidelines while operating to highest efficiency.

3. Humidity Control

a. Dew point and relative humidity control methods shall be available (based on user preference) for humidity control within the conditioned space.

2.13 MULTI-UNIT COORDINATION

A. Liebert iCOM teamwork shall save energy by preventing multiple units in an area from operating in opposing modes. Teamwork allows the control to optimize a group of connected cooling units equipped with Liebert iCOM using the U2U (Unit-to-Unit) network. There shall be three modes of teamwork operation:

1. Teamwork Mode 1 (Parallel): Is best in small rooms with balanced heat loads. The controlling temperature and humidity sensor readings of all units in operation (fan On) are collected to be used for an average or worst-case sensor reading (user-selectable). The master unit shall send the operating requirements to all operating units in the group. The control band (temperature, fan and humidity) is divided and shared among the units in the group.

a. Each unit will receive instructions on how to operate from the Master unit based on how far the system deviates from the setpoints. Evaporator fans and cooling capacity are ramped in parallel.

2. Teamwork Mode 2 (Independent): The Liebert iCOM calculates the worse-case demand for heating, cooling humidification and dehumidification. Based on the greatest demand within the group, each unit operates independently, meaning that the unit may respond to the thermal load and humidity conditions based on the unit's controlling sensors.

   a. All sensor readings are shared.

3. Teamwork Mode 3 (Optimized Aisle): May be employed in large and small rooms with varying heat loads. Optimized Aisle is the most efficient teamwork mode that allows the unit to match cooling capacity with heat load. In the Optimized Aisle mode, the fans operate in parallel. Fans can be controlled exclusively by remote temperature or using static pressure with a secondary remote temperature sensor(s) as an override to ensure that the inlet rack temperature is being met. Cooling (Compressors or Economizer) is controlled through unit supply air conditions. Liebert iCOM calculates the average or worst-case sensor reading (user-selectable) for heating, cooling humidification and dehumidification. Based on the demand within the group, units will be allowed to operate within that mode until room conditions are satisfied. This is the best form of control for a room with an unbalanced load.

2.14 STANDBY LEAD-LAG

A. The Liebert iCOM™ shall allow scheduled rotation to keep equal run time on units and provide automated emergency rotation of operating and standby units.

2.15 STANDBY UNIT CASCADING

A. The Liebert iCOM cascade option shall allow the units to turn On and Off based on heat load when utilizing Teamwork Mode 1, Independent mode or Teamwork Mode 3, Optimized Aisle mode with remote temperature sensors. In Teamwork Mode 1, Cascade mode will stage units On based on the temperature and humidity readings and their deviation from setpoint. In Teamwork 3 Mode, Cascade mode dynamically coordinates the fan speed to save energy and to meet the cooling demands. For instance, with a Liebert iCOM group of six units and only 50% of the heat load, the Liebert iCOM shall operate only four units at 80% fan speed and leave the other two units in standby. As the heat load increases, the Liebert iCOM shall automatically respond to the additional load and bring on another unit, increasing the units in operation to five. As the heat load shifts up or down, the control shall meet the needs by cascading units On or putting them into standby.

2.16 WIRED SUPPLY SENSOR

A. Each Liebert iCOM shall have one factory-supplied and connected supply air sensor that may be used as a controlling sensor or reference. When multiple sensors are applied for control purposes, the user shall be able to control based on a maximum or average temperature reading.

2.17 VIRTUAL MASTER

A. As part of the robust architecture of the Liebert iCOM control, it shall allow for a virtual master that coordinates operation. The Virtual Master function shall provide smooth control operation if the group's communication is compromised. When the lead unit, which is in charge of component staging in teamwork, unit staging and standby rotation, becomes disconnected from the network, the Liebert iCOM shall automatically assign a virtual master. The virtual master shall assume the same responsibilities as the master until communication is restored.

2.18 VIRTUAL BACK-DRAFT DAMPER

A. The Liebert iCOM shall allow the use of a virtual back-draft damper, eliminating the need for a mechanical damper. This shall allow the fans to spin slower (15% or less) to act as a damper.

2.19 COMPRESSOR SHORT CYCLE CONTROL

A. To help maximize the life of the compressor(s), there shall be start-to-next start delay for each single compressor. The control shall monitor the number of compressor starts in an hour. If the compressor starts more than 10 times in 60 minutes, the local display and remote monitoring shall notify the user through a Compressor 1 or 2 Short Cycle event.

2.20 LIEBERT MC™ CONDENSER COMMUNICATION

A. The Liebert iCOM shall communicate directly with the Liebert MC condenser via field-supplied CANbus communication wires and via field-supplied, low-voltage interlock wires. This shall provide enhanced monitoring, alarming, diagnostics, low-noise mode, and condenser-fan reversal for cleaning mode.

2.21 SYSTEM AUTO RESTART

A. The auto restart feature shall automatically restart the system after a power failure. Time delay shall be programmable. An optional capacitive buffer may be provided for continuous control operation through a power failure.

2.22 SEQUENTIAL LOAD ACTIVATION

A. On initial startup or restart after power failure, each operational load shall be sequenced with a minimum delay of one second to minimize total inrush current.

2.23 LOW-PRESSURE MONITORING

A. Units shall ship standard with low-pressure transducers for monitoring individual compressor suction pressure. If the pressure falls due to loss of charge or other mechanical cause, the corresponding circuit shall shut down to prevent equipment damage. The user shall be notified of the low-pressure condition through the local display and remote monitoring.

2.24 WINTER START TIME DELAY—AIR-COOLED MODELS

A. An adjustable software timer shall be provided to assist with compressor starting during cold weather. When the compressor starts, the low-pressure input shall be ignored for the period set in the user-adjustable timer. Once the time period has elapsed after the compressor start, the low-pressure input should remain in the normal state. If the low-pressure input does not remain in the normal state when the time delay has elapsed, the circuit shall lock out on low pressure. The low-pressure alarm shall be announced on the local display and communicated to remote monitoring systems.

2.25 ADVANCED FREEZE PROTECTION

A. Units shall ship standard with advanced freeze protection enabled. The advanced freeze protection shall monitor the pressure of each circuit using a transducer. The control shall interact with the fan and compressor to prevent the unit coil from freezing if circuit suction pressure drops. Applying fan speed to direct expansion systems requires limitations to avoid freezing condensate on the coil when the unit operates below 100% fan speed. Liebert iCOM's advanced freeze protection provides the ability to predict freeze conditions and correct this condition automatically by adjusting fan speed and compressor capacity. If a freeze condition is detected, the user shall be notified through the local display and remote monitoring systems.

2.26 REFRIGERANT PRESSURE TRANSDUCER FAILURE

A. The control shall monitor the high-side and low-side refrigerant pressure transducers. If the control senses the transducer has failed, has been disconnected, has shorted or the reading has gone out of range, the user shall be notified through an event on the local display and remote monitoring. The corresponding circuit that the failure has occurred on shall be disabled to prevent unit damage.

2.27 OIL RETURN PROTECTION

A. The control shall monitor compressor operation and staging to ensure that liquid and hot gas velocity are maintained for proper oil return to the compressor.

2.28 DIGITAL SCROLL HIGH-TEMPERATURE PROTECTION

A. The control shall monitor digital scroll temperature during unit operation. A compressor temperature limit shall be imposed to help prevent damage to the compressor. If the temperature reaches the maximum temperature limit, the compressor shall be locked out for 30 minutes and an alarm shall be annunciated on the local display and through monitoring. After the initial lockout, the control shall continue to monitor compressor temperature during the off-cycle and re-enable the circuit once a safe operating temperature is reached and the 30 minutes has elapsed. The control shall store the number of high-temperature trips. The number of trips shall be accessible through the local display.

2.29 DIGITAL SCROLL SENSOR FAILURE

A. The control shall monitor the status of the digital scroll sensor(s). If the control senses that the thermistor is disconnected, shorted or the reading goes out of range, the user shall be notified through an event on the local display and remote monitoring.

2.30 COMPRESSOR SEQUENCING

A. A user-selectable compressor sequencing parameter shall be provided and shall be accessible through the local display. This sequencing parameter shall present the user with three choices:

1. Always use Compressor 1 as the lead compressor.

2. Always use Compressor 2 as the lead compressor.

3. Auto: The unit shall automatically stage compressors to keep each unit's run time within 8 hours of the other's run time. NOTE: The Auto setting attempts to maintain equal run times between compressors. However, the control will not turn Off a compressor to equalize run time when it is needed to control the space.
    a. First priority: If the safety timings are acceptable for only one compressor, then it is the next to be started/stopped.
    b. Second priority: If both compressors are Off: The compressor with fewer working hours is the next to start.
    c. Third priority: If both compressors are in operation: the compressor that has been operating longer since the last start is the next to be stopped.

2.31 COMPRESSOR HIGH- AND LOW-TEMPERATURE LIMIT PROTECTION

A. The control shall monitor the return air to ensure that the compressor(s) are operated within the manufacturer's defined window of operation. If the return air temperature deviates from the manufacturer's window of operation, the Liebert iCOM shall automatically adjust to prevent damage to the cooling unit or reduction in its reliability.

2.32 COMPRESSOR RUN TIME MONITORING

A. The control shall log these compressor statistics:
    1. Number of compressor starts
    2. Run hours
    3. Average run time
    4. Starts per day
    5. Starts per day worst
    6. Number of high-pressure alarms
    7. Operating phase in which the high-pressure alarm occurred
    8. Number of low-pressure alarms
    9. Operating phase in which the low-pressure alarm occurred
    10. Number of compressor overloads
    11. Number of high-temperature alarms (scroll compressors)

B. The user shall have the ability to monitor compressor operating temperature and pressure from the local display to be used as a diagnostic tool.

2.33 MANUAL COMPRESSOR DISABLEMENT

A. The user shall have the ability to disable compressor operation using a set of either normally open or normally closed dry contacts tied directly to the control or through remote monitoring. An additional enable/disable feature shall be provided to allow the user to permanently disable an individual compressor circuit for maintenance using the local display.

2.34 MANUAL COMPRESSOR OPERATION

A. The user shall be able to operate each compressor(s) manually from the local display. The user shall be able to energize refrigeration components including liquid line solenoid valves, compressor contactors, electronic expansion valves and adjust capacity for troubleshooting or repair. The control shall monitor the compressor during manual operation and shall shut the compressor down if needed to prevent electrical or mechanical damage.

2.35 FLOODED START PROTECTION

A. The control shall isolate each compressor through a dedicated circuit liquid line solenoid valve and/or electronic expansion valve. These devices, combined with a spring-closed discharge check valve and compressor crankcase heater (air-cooled models), shall help ensure refrigerant does not migrate/carry oil out of the compressor case during the off cycle.

2.36 COMPRESSOR DEHUMIDIFICATION

A. The control shall permit the user to specify which compressor is used for dehumidification. The choices shall be 1st compressor, 2nd compressor, 1 or 2, or BOTH.

2.37 HIGH TEMPERATURE SENSOR

A. The high-temperature sensor shall immediately shut down the environmental control system when activated. The high-temperature sensor shall be mounted in the electrical panel with the sensing element in the return air.

2.38 CONDENSATE PUMP, DUAL FLOAT

A. The condensate pump shall have a minimum capacity of 145 GPH (548 l/h) at 20 ft. (58 kPa) head. It shall be complete with integral dual-float switches, pump-and-motor assembly and reservoir. The secondary float shall send a signal to the local alarm and shall shut down the unit upon high water condition.

2.39 WIRED REMOTE SENSORS

A. Each Liebert iCOM shall have up to ten 2T sensors (20 sensor readings total) for control or reference. As part of the U2U network, those sensors shall be shared and used to control the units and provide greater flexibility, visibility, and control using that to respond to changes in the data center. When the sensors are used for control, the user may set the control to be based off a maximum or average of a select highest temperature reading.

2.40 LIEBERT LIQUI-TECT™ SENSORS

A. Provide 2 solid state water sensors under the raised floor.

2.41 FLOOR STAND

A. The floor stand shall be constructed of a welded steel frame. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be 24 in. high.

2.42 RETURN AIR PLENUM FOR DOWNFLOW UNITS

A. The air plenum shall be constructed of 20-gauge steel, powder-coated to match unit color. The plenum shall be 24 in. high. A door shall be included in the front of the plenum to enable front filter access. Air shall enter the plenum from the top.

2.43 AIR-COOLED LIEBERT MC CONDENSER

A. Liebert MC Summary

1. These specifications describe requirements for a Liebert air-cooled condenser for a Liebert Thermal Management system. The condenser shall be designed to reject waste heat to outdoor air and to control refrigerant head pressure as indoor equipment loading and outdoor ambient conditions change.

2. The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

3. Standard 60-Hz units shall be CSA-certified to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and shall be marked with the CSA c-us logo.

B. Liebert MC Design Requirements

1. The air-cooled condenser shall be a factory-assembled unit, complete with integral electrical panel, designed for outdoor installation. The condenser shall be a draw-through design.

C. Liebert MC Standard Features

1. Condenser shall consist of microchannel condenser coil(s), propeller fan(s) direct-driven by individual fan motor(s), electrical controls, housing and mounting legs. The Liebert air-cooled condenser shall provide positive refrigerant head pressure control to the indoor cooling unit by adjusting heat rejection capacity. Microchannel coils shall provide superior heat transfer, reduce air-side pressure drop, increase energy efficiency and significantly reduce the system refrigerant volume required. EC fans and fan operating techniques shall reduce sound levels. Various methods shall be available to match indoor unit type, maximum outdoor design ambient and maximum sound requirements.

D. Liebert MC Coil

1. Liebert MC coils shall be constructed of aluminum microchannel tubes, fins and manifolds. Tubes shall be flat and contain multiple, parallel-flow microchannels and span between aluminum headers. Full-depth louvered aluminum fins shall fill spaces between the tubes. Tubes, fins and aluminum headers shall be oven-brazed to form a complete refrigerant-to-air heat exchanger coil. Copper stub pipes shall be electric resistance-welded to aluminum coils and joints protected with polyolefin to seal joints from corrosive environmental elements. Coil assemblies shall be factory leak tested at a minimum of 300 psig (2068 kPag). Hot-gas and liquid lines shall be copper and shall be brazed using nitrogen gas flow to the stub pipes with spun-closed ends for customer piping connections. Complete coil/piping assembly shall be then filled and sealed with an inert gas holding charge for shipment.

E. Liebert MC™ Fan Motor/Blade Assembly

1. The fan motor/blade assembly shall have an external rotor motor, fan blades and fan/finger guard. Fan blades shall be constructed of cast aluminum or glass-reinforced polymeric material. Fan guards shall be heavy gauge, close-meshed steel wire, coated with a black, corrosion-resistant finish. Fan terminal blocks shall be in an IP54 enclosure on the top of the fan motor. Fan assemblies shall be factory-balanced, tested before shipment, and mounted securely to the condenser structure.

a. Liebert MC Condenser EC Fan Motor

1) The EC-fan motors shall be electronically commutated for variable-speed operation and shall have ball bearings. The EC fans shall provide internal overload protection through built-in electronics. Each EC-fan motor shall have a built-in controller and communication module linked via RS485 communication wire to each fan and the Premium Control Board, allowing each fan to receive and respond to precise fan speed inputs from the Premium Control Board.

F. Liebert MC Electrical Controls

1. Electrical controls and service-connection terminals shall be provided and factory-wired inside the attached control panel section. Only high-voltage supply wiring and low-voltage indoor-unit communication/interlock wiring are required at condenser installation.

a. EC Fan Speed and Premium Control

1) The EC fan/Premium Control System shall include an electronic control board, EC-fan motor(s) with internal overload protection, refrigerant and ambient temperature thermistors and refrigerant pressure transducers. The Premium Control Board shall communicate directly with the indoor unit's Liebert iCOM control via field-supplied CANbus communication wires and via field-supplied low-voltage interlock wires. The control board shall use sensor and communication inputs to maintain refrigerant pressure by controlling each EC fan on the same refrigerant circuit to the same speed. The Premium control board shall be rated to a temperature of –30°F to 125°F (–34.4°C to 51.7°C). The premium control shall be factory-set for (fan speed) (fan speed with Liebert Lee-Temp™) control.

b. Locking Disconnect Switch

1) A locking-type disconnect switch shall be factory-mounted and wired to the electrical panel and be capable of disrupting the flow of power to the unit and controlled via an externally-mounted locking and lockable door handle. The locking disconnect shall be lockable in support of lockout/tagout safety programs.

c. Short Circuit Current Rating

1) The electrical panel shall provide at least 65,000A SCCR.

G. Cabinet

1. The condenser cabinet shall be constructed of bright aluminum sheet and divided into individual fan sections by full-width baffles. Internal structural support members, including coil support frame, shall be galvanized steel for strength and corrosion resistance. Panel doors shall be provided on two sides of each coil/fan section to permit coil cleaning. An electrical panel shall be contained inside a factory-mounted NEMA 3R weatherproof electrical enclosure. Units with the 575V option shall include a second, factory-mounted, NEMA 3R weatherproof electrical enclosure opposite the main electrical enclosure.

H. Liebert MC Mounting Legs Standard Aluminum Legs

1. Aluminum legs shall be provided to mount unit for vertical air discharge with rigging holes for hoisting the unit into position. Standard height is 36 in. (457 mm).

PART 3 EXECUTION

3.1 INSTALLATION OF THERMAL MANAGEMENT UNITS

A. General

1. Install Thermal Management units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated and maintain manufacturer's recommended clearances.

B. Electrical Wiring

1. Install and connect electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

C. Piping Connections

1. Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

a. Supply and Drain Water Piping

1) Connect water supply and drains to air-conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

3.2 FIELD QUALITY CONTROL

A. Start the system in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. These specifications describe requirements for a computer-room environmental-control system. The system shall be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.

B. The manufacturer shall design and furnish all equipment to be fully compatible with heat-dissipation requirements.

3.3 WARRANTY START-UP AND CONTROL PROGRAMMING

A. Engage manufacturer's field service technician to provide warranty start-up supervision and assist in programming of units controls and ancillary panels supplied by them.

END OF SECTION 238124

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 238146

WATER SOURCE UNITARY HEAT PUMPS

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 RELATED WORK SPECIFIED ELSEWHERE

Vibration Isolation: Section 230550
Coils: Section 238216
Motor Controls: Section 230512

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, brochures, performance charts, standard schematic drawings, specifications and installation instructions for each water source heat pump specified.

B. Contract Closeout Submittals:

1. Operation and Maintenance Data: Submit 2 copies to the Engineer, incorporated within maintenance manuals, covering the installed products.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Units shall be rated in accordance with ARI Standard 320.

B. EER ratings must be listed in the ARI Directory.

1.5 MANUFACTURER

A. Furnish and install ClimateMaster Tranquility® SC and SD Water Source Heat Pumps, as indicated on the plans or approved equal. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

B. Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL 60335-2-40 4th Edition, UL 60335-1 6th Edition for the United States and Can/CSA C22.2 No. 60335-2-40:22, CAN/CSA C22.2 No 60335-1:16 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

C. All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall be shipped with each unit.

1. Note: If a unit fails the factory acceptance test, it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.

PART 2 PRODUCTS

2.1 BASIC CONSTRUCTION

A. Horizontal units shall have one of the following air flow arrangements: Left Inlet/Straight (Right)Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge: or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.

B. Vertical units shall have one of the following airflow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, as shown on the plans.

C. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units (horizontal and vertical) must have a minimum of two access panels for serviceability of compressor compartment. Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.

D. Compressor section interior surfaces shall be lined with 1/2-inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 1/2-inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) foil-faced, glass-fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. Units without foil-faced insulation in the air handling section will not be accepted.

E. The heat pumps shall be fabricated from heavy gauge galvanized steel.

F. Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

G. All horizontal units to have factory installed 1-inch (25.4 mm) discharge air duct collars, 1 inch (25.4 mm) filter rails with 1-inch (25.4 mm) filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 1-inch (25.4 mm) filter rails with 1-inch (25.4 mm) filters factory installed. If units with these factory installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for their subcontractor to install these provisions.

H. All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have factory installed 1-inch (25.4 mm) wide filter rails for filter removal from either side. Units shall have a 1-inch (25.4 mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of startup. Filters shall be standard sizes. If units utilize non-standard filter sizes, then the contractor shall provide 12 spare filters for each unit.

I. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply- and return-water connections shall be copper FPT fittings. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractors shall be responsible for any extra costs involved in the installation of units that do not have this feature. Contractors must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

J. 2-inch (50.8 mm) filter frame with removable access door and 2-inch (50.8 mm) Glass Fiber throwaway filters on all units.

K. UltraQuiet package shall consist of additional sound insulation applied to the base pan, removable panels, and blower housing.

L. The unit shall be supplied with extended range insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

M. Console units shall have one of the following air flow and piping arrangements: Bottom Inlet/Right-hand piping; or Bottom Inlet/Left-hand piping as shown on the plans. If units with these arrangements are NOT used, the contractor is responsible for any extra costs incurred by other trades. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect/Engineer must approve any changes in layout.

N. The console cabinet, wall mounted back wrapper and subbase shall be constructed of heavy gauge galvanized steel with a baked polyester powder coat paint finish. Corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. Unit corrosion protection must meet these stringent requirements or unit(s) will not be accepted. Color will be Polar Ice. Both sides of the steel shall be painted for added protection. Additionally, the wall mounted back wrapper shall have welded corner bracing. The easily removable cabinet enclosure allows for easy service to the chassis, piping compartment and control compartment.

O. All console interior surfaces shall be lined with 1/4-inch (6.4-mm) thick, 2 lb/ft3 (32 kg/m3) acoustic flexible-blanket type glass-fiber insulation with a non-woven, anti-microbial treated-mat face. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

P. The console cabinet shall have a 30º sloped top with aluminum rigid bar type discharge grille. Aluminum discharge grille shall be anodized charcoal grey in color including hinged control door. Cabinet shall have rounded edges (0.325-inch/8.255-mm minimum radius) on all exposed corners for safety and aesthetic purposes. Units not having sloped top and rounded corners (0.325-inch/8.255-mm minimum) on front, side, top slope, and top corners shall not be accepted.

Q. Return Air Filter shall be 1-inch (25.4 mm) fiberglass disposable type media for bottom return units (units with subbase) or 1/8-inch (3.2 mm) permanent cleanable type media for front return type units.

1. The unit shall be provided with a motorized outside air damper and damper assembly, factory mounted and wired.

2. The unit shall include an optional architectural-style field-installed return-air grille to help conceal the subbase return-air opening (units with bottom return only).

R. UltraQuiet package shall consist of high- technology sound-attenuating material that is strategically applied to the compressor and compressor compartment in addition to the standard ClimaQuiet system design, to further dampen and attenuate sound transmissions. Compressor is mounted on specially- engineered sound-tested EPDM isolators.

2.2 SC AND SE BLOWER AND MOTOR ASSEMBLY

A. Blowers shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan and motor assemblymust be capable of overcoming the external static pressures as shown on the schedule. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place. Ratings based on a dry coil, and/or no air filter shall NOT be acceptable.

1. Constant Volume (CV) EC motors (sizes 006 to 060): CV EC variable speed ball bearing type motor. The CV EC fan motor shall provide a soft low noise fan start by ramping fan up to full selected speed over a 30 second period, and slowly ramp down fan at the end of each blower cycle, maintain constant CFM, maximize motor efficiency over its static operating range, and provide airflow adjustment in multiple CFM increments. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection.

2. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode may be constant or automatic (humidistat controlled). Constant CFM EC motors without controlled ramp up and ramp down features, with constant CFM speed taps, or with no microprocessor controller are not acceptable.

2.3 SD FAN AND MOTOR ASSEMBLY

A. Fan and motor assembly shall be assembled on a slide out fan deck with quick electrical disconnecting means to provide and facilitate easy field servicing. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan motor shall include a torsionally flexible motor mounting system or saddle mount system with resilient rings to inhibit vibration induced high noise levels associated with "hard wire belly band" motor mounting. The airflow rating of the unit shall be based on a wet coil and a clean filter in place. Ratings based on a dry coil and/ or no filter shall NOT be acceptable.

1. Constant Torque (CT) EC motors (sizes 009 to 018): The (CT) EC fan motor maximizes efficiency over its static operating range and provides airflow adjustment with 4 or 5 speed taps. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection.

2.4 REFRIGERANT CIRCUIT

A. All units shall contain an R-454B sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high-pressure switch, low-pressure (loss-of-charge) switch, water coil low- temperature sensor, and air coil low-temperature sensor. Access fittings shall be factory installed on high- and low-pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be resetat the thermostat or at the contractor-supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.

B. SC and SE - The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets or springs to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with EPDM grommets for maximized vibration attenuation. Compressors shall have thermal overload protection. Compressors shall be located in an insulated compartment away from air stream to minimize sound transmission.

C. SD - Hermetic compressors shall be internally sprung. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.

D. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure.Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

E. Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low-temperature thermostat must be provided to prevent over-cooling an already cold room.

F. Units charged with 62 ounces or greater of R-454B shall be supplied with a Refrigerant Detection System (RDS) with sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables compressor operation, and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants. Units charged with 62 ounces or greater of R-454B that do not have an RDS shall not be acceptable.

1. The Refrigerant Detection System (RDS) package shall consist of the RDS module and sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS triggers an alert through the DDC control system, disables compressor operation, and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants (Optional for sizes 006-048).

2. The unit shall be supplied with extended- range insulation option, which adds closed- cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant- to-water heat exchanger.

2.5 DRAIN PAN

A. SC - The drain pan shall be constructed of a polymer material that inhibits corrosion. Drain outlet shall be connected from pan using provided polymer coupling and clamps that meet UL 2043 as required for discrete products by the IMC and UMC when located in a plenum. If galvanized-steel drain pan is used, it shall be fully insulated on both sides and must meet the stringent 1,000-hour salt spray test per ASTM B117. Drain outlet shall be located at pan as to allow unobstructed drainage of condensate. Drain outlet shall be connected from pan directly to a rubber coupling. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches will NOT be accepted.

B. SD – The drain pan shall be constructed of 304 Stainless Steel to inhibit corrosion. This corrosion protection system shall meet the stringent 1,000-hour salt- spray test per ASTM B117. If plastic-type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal-cycling-shock stress failure over the lifetime of the unit. The drain pan shall be fully insulated. The drain outlet shall be located at pan to allow unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to MPT fitting. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches will not be accepted.

C. SD - The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1,000-hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches will not be accepted.

2.6 ELECTRICAL

A. SC and SE - A control box shall be located within the unit compressor compartment and shall contain a 50VA transformer, 24V activated, two or three-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. The control box on sizes 006 through 060 shall have a door to protect the internal components. The entire control box shall be capable of rotating out of the unit to allow access to the components behind the control box. Low voltage wires shall enter the box through a hole in the lower left side and high voltage wires shall enter the box through a hole in the upper left side. Reversing valve and blower motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24V and provide heating or cooling as required by the remote thermostat/sensor.

1. Disconnect Switch, Non-Fused, classified as motor disconnect.

B. SD - Unit control shall be located under the hinged control door in the sloped top grille. Operating control shall consist of push buttons to select mode of operation "OFF", "HEAT," "COOL," "AUTO", Fan "AUTO" (fan cycles with compressor), Fan "ON" (continuous fan), Fan "LO" (low speed fan), and Fan "HI" (high speed fan). Temperature adjustment shall be accomplished via two push buttons, one labeled with an arrow up, and the other labeled with an arrow down. Control shall include an LCD display for display of temperature and setpoint. Units without an LCD display shall not be accepted.

C. A control box shall be located above the unit compressor compartment and shall contain operating controls as outlined in the paragraph above, 24VAC transformer, double-pole compressor relay, and solid- state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers.

1. Provisions for remote thermostat.

2. Disconnect Switch, Non-Fused.

2.7 SC AND SD - ENHANCED SOLID STATE CONTROL SYSTEM (CXM2)

A. Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

1. Anti-short cycle time delay on compressor operation.

2. Random start on power-up mode.

3. Low-voltage protection.

4. High-voltage protection.
5. Unit shutdown on high- or low-refrigerant pressures.
6. Unit shutdown on low water temperature.
7. Condensate-overflow electronic protection.
8. Option to reset unit at thermostat or disconnect.
9. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs three times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
10. Ability to defeat time delays for servicing.
11. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
12. 24V output to cycle a motorized water valve or other device with compressor contactor.
13. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
14. Water coil low-temperature sensing (selectable for water or anti-freeze).
15. Air coil low-temperature sensing.
16. Minimized reversing-valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.
17. Emergency-shutdown contacts.
18. Entering- and leaving-water temperature sensing.
19. Leaving-air temperature sensing.
20. Compressor-discharge temperature sensing.
    a. NOTE: Units not providing the eight safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

B. When CXM2 is connected to AWC99U01 thermostat or handheld service tool, the installer/service technician can; check DIP switch S2 settings; run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures - water coil (LT1), air coil (LT2), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults. When the AWC99U01 communicating thermostat is used this same functionality can be viewed and adjusted remotely in the web portal or mobile app. Systems not providing remote access, diagnosis, and adjustment functionality will not be accepted.

2.8 SE - ENHANCED SOLID STATE CONTROL SYSTEM (DXM2.5)

A. This control system is a communicating controller.

B. Control shall have the features of the CXM2 control system along with the following expanded features:

1. Removable thermostat connector.
2. Night setback control.
3. Random start on return from night setback.
4. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
5. Dry contact night setback output for digital night setback thermostats.
6. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
7. Ability to work with heat pump thermostats using O or B reversing valve control.
8. Boilerless system heat control at low loop water temperature.
9. Ability to allow up to three units to be controlled by one thermostat.
10. Relay to operate an external damper.
11. Relay to start system pump.
12. 75VA control transformer. Control transformer shall have load side short circuit and overload protection via a built-in circuit breaker.
    a. NOTE: Units not providing the eight safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protection for both drain pans will not be accepted.

C. When DXM2.5 is connected to AWC99U01 communicating thermostat or handheld service tool, the installer/service technician can; check and set CFM; check DIP switch S1, S2, and S3 settings; run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures - water coil (LT1), air coil (LT2), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults. When the AWC99U01 communicating thermostat is used this same functionality can be viewed and adjusted remotely with the only portal or mobile app. Systems not providing remote access, diagnosis, and adjustment functionality will not be accepted.

2.9 REMOTE SERVICE SENTINEL (CXM2/DXM2.5)

A. The solid-state control system shall communicate with applicable thermostats to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat, indicating a lockout. A detailed message shall be provided at the communicating thermostat or service tool and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. Units that do not provide this remote service sentinel shall not be acceptable.

2.10 MPC (MULTIPLE PROTOCOL CONTROL) INTERFACE SYSTEM.

A. Units shall have all the features listed above (either CXM2 or DXM2.5) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

1. Space temperature.
2. Leaving-water temperature.
3. Discharge-air temperature.
4. Command-of-space temperature setpoint.
5. Cooling status.
6. Heating status.
7. Low-temperature sensor alarm.
8. Low-pressure sensor alarm.
9. High-pressure switch alarm.
10. Condensate-overflow alarm.
11. High-/low-voltage alarm.
12. Fan "ON/AUTO" position of space thermostat as specified above.
13. Unoccupied / occupied command.
14. Cooling command.
15. Heating command.
16. Fan "ON/AUTO" command.
17. Fault-reset command.
18. Itemized fault code revealing reason for specific shutdown fault (any one of seven).

B. This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built-in circuit breaker.

2.11 FIELD-INSTALLED OPTIONS

A. Hose Kits

1. SC - All units shall be connected with hoses. The hoses shall be braided stainless steel; fire-rated hoses complete with adapters. Only fire rated hoses will be accepted.

2. SE – All units shall be connected with hoses. The hoses shall be braided stainless steel; fire-rated hoses complete with adapters. Only fire rated hoses will be accepted.

3. SD - Hoses shall be 1-foot (31 cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

a. NOTE: Threaded connection piping option must be ordered for hose kit connections.

1) Option: 2-foot (61-cm) hose lengths instead of standard 1-foot (31-cm) length.

B. Valves

1. The following valves are available and will be shipped loose:

a. Ball valve; bronze material, standard port full flow design, FPT connections.

b. Ball valve with memory stop and PT port.

c. "Y" strainer with blowdown valve; bronze material, FPT connections.

d. Motorized water valve; slow acting, 24V, FPT connections.

C. Hose Kit Assemblies

1. The following assemblies ship with the valves already assembled to the hose described:

a. Supply and return hoses having ball valve with PT port.

b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.

c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.

d. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

2.12 DDC SENSORS

A. ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional interface system (CXM2/DXM2.5) described above. Types as described below:

1. Sensor only with no display (MPC).

2. Sensor with setpoint adjustment and override (MPC only).

3. Sensor with setpoint adjustment and override, LCD display, status/fault indication (MPC).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units of type as indicated, in complete accordance with the manufacturer's instructions and as indicated.

B. Provide services of manufacturer's technical representative as required for start-up of heat pump system to insure proper operation of installed heat pumps.

C. Support:

1. Support floor mounted units as shown in detail on the drawings. Provide vibration isolators between units and supports.

2. Support ceiling hung units from the overhead construction by means of rod type hangers, unless otherwise indicated. Provide vibration isolators of the rubber-in-shear type, designed for insertion in a split-hanger rod.

3.2 WARRANTY

A. ClimateMaster shall warranty equipment for a period of 12 months from startup or 18 months from shipping (whichever occurs first).

1. Extended 4-year compressor warranty covers compressor for a total of 5 years.

2. Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

3. Extended 4-year control board warranty covers the CXM2/DXM2.5 control board for a total of 5 years.

END OF SECTION 238146

SECTION 238147

WATER TO WATER HEAT PUMP

PART 1 GENERAL

A. Furnish and install ClimateMaster "SW" Water-Source Heat Pumps as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

B. Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. All equipment listed in this section must be rated in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-2). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

C. All units shall pass a factory acceptance test. The quality control system shall automatically perform factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit. (Note: If unit fails the factory acceptance test, it shall not be allowed to ship. Unit serial number shall be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.)

PART 2 PRODUCTS

2.1 BASIC CONSTRUCTION

A. All units must have multiple removable panels for serviceability of compressor compartment. Units having only one access panel shall not be acceptable. All units must have front access for side by side installations.

B. The heat pumps shall be fabricated from heavy gauge galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection. All interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Insulation placement shall be designed in a manner that will eliminate any exposed edges.

C. Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

D. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature**.** Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

E. Unit(s) shall have exterior indicator lights showing, 1) compressor operation (on/off) and 2) unit "fault" status. Contractor shall be responsible for providing control circuitry and indicator lights for units not providing this feature.

F. UltraQuiet package – Size 036, 060, 120 include sound attenuating insulation on unit base pan and all removable panels plus a refrigerant line muffler.

2.2 REFRIGERANT CIRCUIT

A. Units shall have sealed, isolated refrigerant circuit(s), each including a high efficiency scroll compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, a reversing valve, load and source coaxial (tube in tube) refrigerant to water heat exchangers, and safety controls including a high pressure switch, low pressure switch (loss of charge), and low water temperature sensors. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. Units with brazed plate heat exchangers will not be accepted.

B. Unit shall be supplied with extended range insulation, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchangers.

C. Hermetic compressors shall be internally sprung. The compressors shall have a dual level vibration isolation system. The compressors will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressors shall have thermal overload protection.

D. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 450 PSIG (3101 kPa) working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93). For all models except 170 & 340, which are powder coated.

E. Units charged with 62 ounces or greater of R-454B shall be supplied with a Refrigerant Detection System (RDS) with sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables compressor operation and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants. Units charged with 62 ounces or greater of R-454B that do not have an RDS shall not be acceptable.

2.3 ELECTRICAL

A. A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24 volt activated, 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote aquastat / sensor. Units with two compressors (120 and 340) shall have a solid-state time delay relay and random start to prevent both compressors from starting simultaneously.

2.4 ENHANCED SOLID STATE CONTROL SYSTEM (CXM2)

A. Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

a. Anti-short cycle time delay on compressor operation.

b. Random start on power up mode.

c. Low voltage protection.

d. High voltage protection.

e. Unit shutdown on high or low refrigerant pressures.

f. Unit shutdown on low water temperature.

g. Option to reset unit at thermostat or disconnect.

h. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.

i. Ability to defeat time delays for servicing.

j. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.

k. 24V output to cycle a motorized water valve or other device with compressor contactor.

l. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.

m. Water coil low temperature sensing (selectable for water or anti-freeze).

n. Air coil low temperature sensing.

o. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life).

p. Emergency shutdown contacts.

q. Entering and leaving water temperature sensing.

r. Leaving air temperature sensing.

s. Compressor discharge temperature sensing.

NOTE: Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

2.5 MPC (MULTIPLE PROTOCOL CONTROL) INTERFACE SYSTEM

A. Units shall have all the features listed above (CXM) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. Source leaving water temperature

b. Load leaving water temperature

c. Command of space temperature setpoint

d. Cooling status

e. Heating status

f. Low temperature sensor alarm

g. Low pressure sensor alarm

h. High pressure switch alarm

i. Hi/low voltage alarm

j. Unoccupied/occupied command

k. Cooling command

l. Heating command

m. Fault reset command

n. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

B. This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

PART 3 EXCUTION

3.1 INSTALLATION

A. Hose Kits

1. All units shall be connected with hoses. The hoses shall be 2 feet (61cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

B. Valves

1. The following valves are available and will be shipped loose:

a. Ball valve; bronze material, standard port full flow design, FPT connections.

b. Ball valve with memory stop and PT port.

c. "Y" strainer with blowdown valve; bronze material, FPT connections.

d. Motorized water valve; slow acting, 24v, FPT connections.

C. Hose Kit Assemblies

1. The following assemblies ship with the valves already assembled to the hose described:

a. Supply and return hoses having ball valve with PT port.

b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.

c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.

d. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

3.2 WARRANTY

A. ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).

B. Extended 4-year compressor warranty covers compressor for a total of 5 years.

C. Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

D. Extended 4-year control board warranty covers the CXM/DXM control board for a total of 5 years.

END OF SECTION 238147

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 238413

HUMIDIFIERS

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.QUALITY

1.2 SUMMARY

A. This Section includes the following humidifiers:

1. SKE4 Electric steam humidifiers and accessories

1.3 DEFINITION

A. Low Voltage: As defined in NFPA70 for circuits and equipment operating at less than 50V or for remote control, signalling power limited circuits.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail fabrication and installation of humidifiers. Include piping details, plans, elevations, sections, details of components, manifolds, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which humidifiers will be attached.

D. Instructions: Submit manufacturer's installation, operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Listed and labelled as defined in NFPA70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked intended use.

B. Comply with ARI 640, "Commercial and Industrial Humidifiers."

C. Quality management system shall comply with ISO 9001:2015 certification.

1.6 COORDINATION

A. Coordinate location and installation of humidifiers with manifolds in ducts and air-handling units or occupied space. Revise locations and elevations to suit field conditions and to ensure proper humidifier operation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Waste Management and Disposal:

1. Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.8 WARRANTY

A. Product shall be warranted to be free from defects in materials and fabrication for a period of two years from the ship date.

PART 2 PRODUCTS

2.1 SELF-CONTAINED HUMIDIFIERS

A. Manufacturer: Subject to compliance with requirements, provide products by

1. Neptronic

2.2 SKE4 ELECTRIC RESISTIVE STEAM HUMIDICATION SYSTEM

A. General:

1. Provide self-contained, microprocessor controlled, wall mounted, electric resistive steam humidifiers as indicated, of size and capacity as scheduled. Electrode technology is not acceptable.

2. Humidifier shall meet the requirements of UL 998 and CSA C22.2 No.104 standards to comply with ETL certification.

B. Humidifier cabinet:

1. The humidifier casing shall be constructed of cold roll steel and stainless steel base with baked enamel finish to prevent rust.

2. For safety and security reasons, all components, electrical wiring and plumbing connections will not be exposed and must be contained within the cabinet of the unit.

3. The compartmentalized enclosure shall separate the plumbing, controls, and high-voltage sections, preventing heat, humidity or water transfer to the electrical sections and ensuring that the evaporation chamber remains isolated.

4. The plumbing compartment shall be equipped with a drip tray.

5. The front of the unit and the high voltage compartment shall have a lockable door to restrict access by unauthorized personnel.

C. Evaporation chamber:

1. Steam shall be generated in a stainless steel cleanable evaporation chamber.

2. The evaporation chamber shall be easily serviceable and removable from the unit. No tools are required during servicing.

3. The electronic level sensing assembly remains permanently fixed and separate from the evaporation chamber.

4. The heating elements and manual reset high temperature safety cut-out switch remain fixed in place, even as the evaporation chamber is removed for service cleaning.

5. The evaporation chamber shall have a water port designed to minimize the risk of blockage caused by sediment build-up. The water port will be easily detachable for servicing by means of a single quick connect assembly.

D. Immersion heating element(s):

1. Steam shall be generated by self-cleaning 800/825 Incoloy electric heating immersion elements.

2. The heating elements shall have a high expansion factor, minimizing mineral deposits and enabling most of them to break off and fall to the bottom of the chamber.

E. Water level control:

1. The water level detection system shall be self-cleaning, self-calibrating and equipped with a redundancy system, consisting of a high-resolution capacitive sensor and two fail-safe resistive sensors.

2. The humidifier must have the ability to sense foam and take a corrective action by going into drain cycle.

3. For safe temperature operation, the humidifier must have both an electronic temperature sensor inside the evaporation chamber and an external bimetallic temperature cut-off.

F. Water requirements:

1. The humidifier shall operate under all types of water including tap, deionized and reverse osmosis water, with no additional parts required.

G. Feed water:

1. The supply water to the unit shall be controlled by a quiet three port solenoid valve equipped with flow regulators, to supply water into the evaporation chamber, temper the hot water during a drain and clean the water level sensors.

2. To conserve energy, any hot water skimming during normal FILLING cycle is not acceptable.

3. The humidifier shall have a check valve in the fill water line to prevent backflow of hot contaminated water into the water supply system.

4. The humidifier shall have a pulsed fill mode to ensure that boiling does not stop while the humidifier is refilling, in order to maintain a constant steam output.

H. Drain:

1. The humidifier shall have a drain pump which provides a quick drain cycle, minimizing the down time.

2. The humidifier shall have four draining strategies: periodic full drain cycle, water dilute system, AFEC and configurable drain schedule, ensuring maximum energy efficiency, optimal steam output stability and minimal steam output interruptions.

3. To enhance safety and minimize energy consumption, the humidifier shall vary the drain time periods according to variations in water conditions.

4. After 72 hours of no demand, the humidifier will go into "Tank Rinse" or end of season mode, completely draining the unit to eliminate stagnant water.

I. Manual drain valve:

1. The humidifier shall be supplied with a manual drain valve which ensures that the unit can be drained even during a power failure.

J. Disconnect switch:

1. For safety reasons and to conform to local regulations, the humidifier shall have a built-in factory wired disconnect switch, to easily turn off the power without opening any access doors, ensuring that the power is off when accessing the electrical panels. An external disconnect switch is not required.

K. Controller:

1. The humidifier shall have an alphanumeric display and control module with 8 function buttons for fast configuration and operation.

2. The Idle Screen shall display common information including humidity demand, actual steam output and state of operation. It will also indicate special diagnostic parameters such as abnormal operation, time delays, etc.

3. The humidifier shall be programmable using the menu buttons to view and configure settings including control method, %R.H. set point, control signal type, and indication on number of actual service hours.

4. After the maximum number of hours of operation before servicing is due has been exceeded, the unit will display a need for servicing and the Status Display LED on the control panel will turn red.

L. SD card:

1. The unit shall be equipped with an SD card slot, to allow for simplified troubleshooting, by storing a history log of all humidifier trends and alarms.

2. The SD card shall allow for on-site firmware upgrades.

M. USB connection:

1. The unit shall be equipped with a USB port, to allow on-site firmware upgrades.

N. Scheduling system:

1. The humidifier shall be equipped with a configurable and independent scheduling system for unit operation and drain cycle, ensuring that the unit does not operate or drain when not necessary.

O. User rights management:

1. The electronic controller shall be equipped with a user rights management system, which simplifies operation and protects the humidifier from unwanted access by displaying only the features associated to the type of user logged in.

P. Building automation systems:

1. The humidifier shall be equipped with communication protocols, including BACnet MS/TP, Modbus RTU, LonWorks, BACnet UDP/IP, or Modbus TCP/IP, for integration with a building management system (BMS).

2. These protocols shall be available via a plug-in module for simple upgrade of units already in the field.

Q. Web services:

1. The humidifier shall be equipped with web services enabling humidifier parameter configuration, and access to diagnostics and other functions remotely using the internet.

R. Modulating control:

1. The control modulating signal shall be 0-10 VDC or 2-10 VDC, 4-20 mA or 0-20 mA to modulate 0-100% of the capacity.

2. The maximum output (SPAN) can be minimized by using the electronic "MAX OUTPUT" setting.

3. Modulation of all elements shall be achieved using silent SSR's with zero voltage crossing detection and firing. The SSR's will be backed up by an electro-mechanical contactor.

4. To avoid harmonics and peak electrical loads, Time Proportioning modulation using only electro- mechanical relays will not be acceptable.

S. Space distribution unit (SDU):

1. Stainless steel manifold with integral fan to discharge vapour directly into occupied space.

T. Steam distribution manifold (S.A.M.):

1. Type 304 stainless steel manifold with brass nozzle inserts which provide uniform steam distribution over entire length.

U. Steam distribution manifold (S.A.M.E2):

1. Type 304 stainless steel manifold with brass nozzle inserts which provide uniform steam distribution over entire length, used in applications with restricted duct dimensions.

V. Steam dispersion panel (Multi-Steam SD):

1. Type 304 stainless steel non-insulated tubes and header, with brass insertion nozzles to prevent condensate from escaping.

2. All tubes shall be completely factory assembled with welded connections requiring no gaskets.

3. Each dispersion tube shall be fitted with one or two rows of dispersion brass nozzles.

4. The brass nozzles shall discharge steam in diametrically opposite directions, perpendicular to airflow.

5. The nozzles extend into the interior of the steam tube, preventing condensed droplets from being dropped into the duct.

W. Steam dispersion panel (Multi-Steam HD):

1. Type 304 stainless steel insulated tubes and header, with 304 stainless steel eyelets to prevent condensate from escaping.

2. All tubes shall be completely factory assembled requiring no gaskets.

3. Each dispersion tube shall be fitted with one or two rows of dispersion stainless steel eyelets.

4. The stainless steel eyelets shall discharge steam in diametrically opposite directions, perpendicular to airflow.

5. The eyelets extend into the interior of the steam tube, preventing condensed droplets from being dropped into the duct.

X. OSHPD:

1. The humidifier shall conform to the requirements of the OSHPD seismic certification.

PART 3 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

A. Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

END OF SECTION 238413

SECTION 260000

SCOPE OF WORK

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 SCOPE OF WORK

The following is a general listing of work items to be provided under this Contract which is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed:

A. Provide a underground electrical services entrance as indicated on the contract documents.

B. Provide double ended switchboard with programmable breakers as indicated.

C. Provide distribution switchboards as indicated on the contract documents.

D. Provide stand-by power generation system including manual transfer switches, distribution panelboards, portable generator connection box, load bank, fuel tank, fuel polishing system, weatherproof enclosure, and required conduit and wiring.

E. Provide branch and distribution panelboards, protective devices, branch circuit wiring and raceways as indicated on the contract documents and as required.

F. Provide interior and exterior light fixtures, controls and wiring devices as shown.

G. Provide power circuit wiring, raceways, and devices for wiring of motors, appliances and equipment furnished by other trades as required.

H. Provide conduit, cable, and outlet system as required to extend and expand the existing data, telephone, and cable television systems as indicated on the contract documents.

I. Provide fire alarm electrical rough-ins, Vesda air aspirating smoke detector and associated tubing, conduit, boxes and cable, as indicated on the contract documents.

J. Provide server room UPS system as indicated on the contract documents.

K. Provide roof mounted photovoltaic system, including all mounting hardware, conduit, wiring, inverters, transformer, disconnect switches, and all required accessories and hardware as indicated on contract documents.

L. Provide battery energy storage system (BESS) as indicated on contract documents.

M. Provide underground conduit system for electrical services, IT and communications providers, including concrete encasement, handholes and pull ropes as indicated on contract documents.

N. Provide UL listed lightning protection system per NFPA 780.

O. Provide grounding system per Motorola R56 "Standards and Guidelines for Communication Sites" April 2017, and per NFPA 70.

P. Provide wiring devices as shown.

Q. Operationally test and check all installed equipment.

R. Provide temporary wiring, lighting and power as needed to suite the job requirements. Temporary wiring and lighting must be performed and removed in accordance with the latest recognized edition of the NEC.

S. Provide temporary electrical services to contractor's trailers. Minimum service size to each trailer shall be 200amp, 120/240V, single phase. Coordinate requirements and associated costs with contractors. Coordinate service with Central Hudson Gas and Electric utility Co.

T. Provide temporary telephone services to contractor's trailers. Coordinate requirements and associated costs with contractors. Coordinate service with local telephone utility Co.

END OF SECTION 260000

SECTION 260010

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to this Section.

1.2 CONFLICTS

A. If, in the interpretation of contract documents, it appears that the drawings and specifications are not in agreement, the Contractor is to contact the Engineer. The Engineer shall be the final authority. Addenda supersede the provisions which they amend.

B. In the absence of a written clarification by the engineer, the Contractor must install his work in accordance with the more stringent and/or costly condition. Contractor assumes full responsibility for any and all items furnished and installed without the written approval by the Architect or Engineer. Under no circumstances will a change order be accepted for work installed that was not approved by the Architect or Engineer.

1.3 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations:

EC: The Contractor performing the electrical work.
MC: The Contractor performing the heating, ventilating, air conditioning, and mechanical work.
PC: The Contractor performing the plumbing work.
GC: The Contractor performing the general building work.
CM: The Construction Manager.

References to the above designations are not intended to define contracts and/or subcontracts but only as reference to where items are shown on drawings or described in specifications.

B. Definitions:

Concealed: Embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.
Exposed: Not installed underground or concealed.
Noted: As indicated on the drawings and/or specified.

Indicated or Shown: As indicated or shown on the drawings.

Wiring: Conduits, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and items necessary or required in connection with or relating thereto.

Provide: Furnish and install

1.4 DRAWINGS AND SPECIFICATIONS

A. Intent:

1. Provide all items and work indicated on the Contract Documents. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable heating, ventilating, air conditioning, electrical and plumbing systems. Perform start-up and testing of each item and system to provide fully operable systems.
2. Provide all materials as required for complete systems, including all parts and labor obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be fully operational, prior to Owner's acceptance.
3. Neither the specifications nor the drawings undertake to illustrate or describe all items necessary for the work; it is expected that the EC shall be familiar with all applicable codes and shall provide an electrical installation in conformance with all applicable codes.
4. After review of the drawings and specifications, the EC shall be completely familiar with the function of all items included and that his bid shall reflect the inclusion of all hangers, racks, inserts, etc., necessary for a complete and operable system. The EC shall provide offsets, fittings and accessories as may be required to meet such field conditions. The EC shall make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in remuneration.
5. Items of work shown on the contract documents shall be furnished and installed as appearing on both drawings and specifications.
6. Equipment, conduit, etc., shall be installed to avoid interferences with the operation, servicing and maintenance of equipment.
7. Certain materials and equipment shall be provided by other trades. The EC shall examine the Contract Documents to ascertain these requirements. Unless specifically indicated as being supplied or installed by others, all items of work shown on the drawings or indicated in the specifications shall be included by the Contractor in his bid.
8. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as a result of the EC's failure to check or verify dimensions, measurements, etc., shall be corrected at the EC's expense.
9. The Contractor shall review the contract documents for the work of other trades, informing the Architect of any conditions which obstruct, interfere with, or in any way prevent him from completing his work in a first class manner.
10. The EC shall participate in the coordinated shop drawing procedure with the MC and PC. The EC shall note the location and elevation of all conduits 1-1/2" or greater.

1.1 DESCRIPTION OF WORK

A. Extent of electrical related work required by this section is indicated in the contract documents.

B. Provide 120-volt power to control panels provided by other trades, as required.

C. Work also includes minor items which may not be shown or mentioned, but are necessary for a complete, working electrical installation.

D. Provide all labor, materials, tools, equipment, transportation and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or herein.

E. Provide temporary power and lighting as required for construction operations and for ample job site security, and per Division 1.

F. If, in the interpretation of contract documents, it appears that the drawings and/or specifications are not in agreement, the one requiring the greater quantity or superior quality shall prevail, as decided by the Engineer. Addenda supersede the provisions which they amend.

G. Requirements of Regulatory Agencies: Applicable local, state and national laws, statutes, building codes and regulations as well as utility company requirements shall govern the complete installation.

H. Permits: Obtain permits and pay all fees required by the local inspecting authority.

I. Reference Standards: The latest applicable recognized editions of the following codes, standards, and specifications shall be considered minimum requirements:

1.	(BCNYS)	2020 Building Code of New York State
2.	(ECCCNYS)	2020 Energy Conservation Construction Code of New York State
3.	(FCNYS)	2020 Fire Code of New York State
4.	(ADA)	Americans with Disabilities Act
5.	(ANSI)	American National Standards Institute
6.	(ASTM)	American Society for Testing and Materials
7.	(CBM)	Certified Ballast Manufacturers
8.	(ETL)	Electrical Testing Laboratories
9.	(IBC)	International Building Code
10.	(ICEA)	Insulated Cable Engineers Association
11.	(IEEE)	Inst. of Electrical and Electronics Engineers
12.	(IES)	Illuminating Engineering Society
13.	(IPCEA)	Insulated Power Cable Engineers Association
14.	(IRC)	International Residential Code
15.	(ITL)	Independent Testing Laboratories
16.	(NETA)	International Electrical Testing Association
17.	(NBFU)	National Board of Fire Underwriters

18. (NEMA) National Electrical Manufacturers Association
19. (NESC) National Electric Safety Code
20. (NFPA) National Fire Protection Association
21. (UL) Underwriters' Laboratories
22. Local Codes
23. Public Health Service Regulations
24. Local Utility Standards and Regulations

J. Tests and Adjustments: The EC shall furnish testing equipment, instruments and personnel to perform any test procedures and adjustments required by the National Electrical Code, the utility company and the authority having jurisdiction to establish proper performance and installation of electrical equipment and materials.

K. Utility Requirements: Comply with the following

1. Central Hudson Gas and Electric "Specifications and Requirements for Electric Installations". Dated January 2024.
2. Perform all testing and inspections required by the utility company for a complete installation at all schools.
3. Any additional utility company requirements.

1.2 SUBMITTALS

A. General: Prepare and submit for approval, all submittals required by this and subsequent Division 26 sections, and by all other Contract Documents for this Project.

B. Types: Required submittals may include: Schedule of Values; List of Subcontractors and Materials; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Documents; Rebate Applications (including all submittals, backup information, copies of receipts, etc. needed to obtain all applicable electric utility company incentives); and other various administrative submittals.

C. Number and Format: One electronic PDF format copy.

D. Product Data: Submit for equipment, devices and materials as required in subsequent individual Division 26 sections. Product Data to consist of manufacturer's standard catalog cuts, descriptive literature and/or diagrams, in 8-1/2" X 11" format, and in sufficient detail so as to clearly indicate compliance with all specified requirements and applicable standards. Mark each copy to clearly indicate proposed product, included options, accessories, finish, size, type, etc.

E. Shop Drawings: Submit for equipment and systems as required in subsequent individual Division 26 sections. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the shop drawing submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, and model or series number where applicable, dimensions, nameplate data, sizes, capacities, types, fabrication materials, materials list, performance data, features, accessories, wiring diagrams, etc. in sufficient detail so as to clearly indicate compliance with all specified requirements and applicable standards. Submit Shop Drawings with related Product Data submittals.

Description	Shop Drawings	Wiring Diagram
Circuit and Motor Disconnects	X	
Overcurrent Devices	X	
Exterior Pad-Mounted Switchgear	X	X
Liquid-Filled Pad-Mount Transformer	X	X
Switchgear and Switchboards	X	X
Panelboards	X	X
Transformers, Under 600V	X	X
Metering equipment	X	X
Light Fixtures	X	X
Fire Alarm System	X	X
Wiring Devices	X	
Raceways	X	
Grounding	X	
Conductors & Cable	X	
Medium Voltage Terminations/Splices	X	
Generator	X	X
Generator Fuel Tank	X	
Load Bank	X	X
Battery Energy Storage System	X	X
PV System	X	X
Lightning Protection System	X	X
Deicing System	X	X
Handholes	X	X

F. Operation and Maintenance Data: Upon completion of the work, prepare and deliver to the Owner complete operating and maintenance manuals for systems and major equipment installed as outlined in Division 1 of the project specifications. Include all updated materials listed above in submission, including as-built wiring diagrams.

G. Maintenance Manuals: Include operating and maintenance data for each Division 26 section requiring a Product Data and/or Shop Drawing submittal. Include the respective Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer's printed operating, maintenance, trouble shooting, repair, adjustment and emergency instructions and diagrams, complete replacement parts listing, and the name, address and telephone number of the installing contractor and/or subcontractor, and for the nearest manufacturer's authorized service dealer.

H. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all electrical equipment and devices, routing of major interior building raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Make provisions for delivery and safe storage of all materials. Check and properly receipt material to be "furnished by others" to contractor, and assume full responsibility for all materials while in storage with full visible identification and information.

B. Delivery of Equipment: Make the required arrangements with General Contractor for the introduction into the building of equipment too large to pass through finished openings. Protect equipment against weather, damage, and vandalism.

1.4 PROTECTION OF EQUIPMENT

A. The EC shall, at his own expense, protect his work, material and equipment and is liable to injury during the construction period. The EC shall be held responsible for all damages and theft until his work is fully and finally accepted.

1.5 PROJECT CONDITIONS

A. Existing Conditions: Field verify all conditions that will determine exact locations, distances, levels, dimensions, elevations, etc. Review all drawings of other trades and report any conflicts to the Architect/Engineer which will affect the project cost.

B. Dimensional information used for layout and locations shall be taken from architectural or structural drawings used by the construction trades.

C. Certain electrical drawings are diagrammatic and have no dimensional significance. Locations of equipment are to be as:
1. Shown on the dimensioned drawings;
2. Directed in the field;
3. Required for proper connection of equipment to be served;
4. Required for proper symmetry in the space involved;
5. With deviations made only with specific approval of Architect/Engineer.

D. Division 26 shall review the drawings of other divisions, exchange shop drawings with them and cooperate in the preparation of space layouts as required to avoid conflicts and interferences with the installation of other trades in advanced stages of construction. Refer to Division 1specfication sections.

E. The Owner or Owner's representative reserves the right to relocate an outlet or outlets, six (6) feet in any direction from locations indicated on plans, before roughing-in, with no change in contract price.

1.6 PREPARATION

A. If products and materials are specified or indicated on the drawings for a specific item or system, those products or materials shall be used. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of shop drawings.

B. All products shall be new, clean, undamaged, and free of defects and corrosion.

C. All products shall be shipped and stored in a manner which shall protect them from damage, weather and entry of debris. If items are damaged, they shall not be installed. The EC shall take immediate measure to obtain replacement or repair in order to maintain the schedule.

D. The EC shall verify that all materials he or his suppliers select conform to the requirements of the drawings and specifications. Transmittal of drawing and specification information to manufacturers supplying materials, and adherence to these requirements is the EC's responsibility. Approval of manufacturer's name by the Engineer does not release the EC of the responsibility for providing materials which comply in all respects with the requirements in the contract documents.

1.7 ALTERATION WORK

A. The EC shall inspect the site and become familiar with the condition of the premises and the scope and character of work required. Additional compensation for adverse field conditions shall not be approved.

B. The EC shall minimize interference with the working routine of occupied areas, by coordinating the performance of his work in a manner acceptable to all groups involved.

C. The EC shall not interrupt any of the building's electrical services in any way without the expressed written permission of the Owner. Ample written notice of shutdowns shall be given well in advance to the Owner. Interruptions and interference shall be made as brief as possible and only at times as stated by the Owner. When temporary loss of services is unavoidable, it shall be made at times as shall cause the least interference with the established routine. The EC shall maintain electrical continuity to adjoining spaces which may be outside the contract area.

D. The EC shall obtain the Owner's permission before utilizing any room or any other part of the building as a shop or for storage of electrical materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Acceptable electrical materials and equipment shall be new and of the type and quality specified or shown on drawings. They shall be listed by Underwriter's Laboratories, Inc. and bear their label where standards have been established. Permission to substitute equal or superior items of materials and equipment may be requested by following the procedure outlined in the Division 1 "Substitutions" of the project specifications. Completion date will not be extended because of any time lost due to consideration or installation of substitutions. All coordination of substituted equipment shall be the Contractor's responsibility.

B. In purchasing materials and equipment to be furnished and installed under this contract the contractor shall convey to the Owner all rights and privileges extended by the various manufacturers thereof in the form of warranties and guarantees covering quality and performance of such items.

C. Fire-stopping for all conduit and cables passing through fire rated floors and walls shall be accomplished by the use of preformed square tubes with an intumescent material insert that adjusts automatically to cable additions or subtractions. Product shall be provided with steel wall plates allowing for single or multiple devices to be ganged together. Product shall be Specified Technologies Inc. (STI) EZ-PATH and intumescent sealant series SSS fire rated pathway, Wiremold FlameStopper or equal.

D. All electric materials and equipment are to comply with all utility company requirements.

PART 3 EXECUTION

3.1 GENERAL

A. All work described in these contract documents and all work required by this Contract shall be executed in a thoroughly substantial and workmanlike manner by skilled mechanics in the various trades involved. Follow manufacturer's instructions for installing, connecting and adjusting all equipment.

3.2 CUTTING AND REPAIRING

A. All normal cutting, drilling, chasing and patching required for accommodation of the electrical work shall be accomplished by the EC. Work shall be carefully laid out in advance and performed in a skilled manner. Any damage to the building piping, equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.

3.3 EQUIPMENT LAYOUT

A. Install all equipment to permit removal (without damage to other parts) of coils, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. Provide access panels in equipment, ducts, etc., as required for inspection of interiors and for proper maintenance.

B. Arrange equipment to permit access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging doors and access panels.

C. The EC shall provide the Owner with all special tools needed for proper operation, adjustment and maintenance of equipment.

3.4 TESTS AND INSPECTIONS

A. Notify proper authorities for inspections of work required by applicable codes, rules or regulations. Completed work must be inspected and certified by an inspection agency acceptable by the Engineer. Systems to be inspected include:

1. Underground Work
2. Concealed Work
3. Distribution and Branch Circuits
4. Illumination System
5. Grounding System
6. Receptacles
7. Connections to Mechanical Equipment
8. Transformers
9. Panelboards
10. Switchboards
11. Exterior Pad-mounted Primary Switchgear
12. Exterior Liquid-filled Primary Transformer
13. Underground Primary Electrical Service
14. Temporary Building Services

B. Operational test will be performed on all electrical equipment as recommended by the applicable manufacturer. Test all wiring and connection for continuity and grounds before energizing any system.

C. The grounding electrode system to include the column ground conductors shall be tested to show satisfactory grounding. The test shall be performed by the EC or his designated representative. A "Fall Off Potential Test" shall be performed on the grounding electrode system. The test equipment used to perform this test shall be designed specifically for "Fall Off Potential" Testing. This test shall be performed with U.L. listed testing equipment. Resistance to ground shall in no case exceed five (5) ohms.

D. Prior to the acceptance of the completed work under this Contract, the EC shall balance and test the complete installation specifically accomplishing the following:

1. Load each panel individually, balancing the load on each phase by necessary recircuiting. Record loads.
2. Load distribution panels, balancing the load on each phase by necessary recircuiting. Record loads.
3. Make necessary changes in feeder connection to balance entire system.
4. Check for grounds, shorts, etc., on all fixtures, equipment, apparatus, etc., and leave system in satisfactory operating condition.
5. Load test various parts of the system as directed by the Engineer, to determine if excessive heat is developed in panels, switches, wiring, etc.

E. Clean up, remove all waste material each day, and clean all lamps, lenses, lighting fixtures, cabinets, and electrical equipment prior to final inspection.

F. Coordinate all inspections and testing requirements with the utility and the authority having jurisdiction.

G. Perform all tests as required by the utility company and the authority having jurisdiction.

H. Schedule all inspections and testing as required by the utility and the authority having jurisdiction.

I. Perform testing as indicated in section 260810 and any other division 26 sections.

3.5 ADMINISTRATION AND SUPERVISION

A. The EC shall have a licensed electrician, with-in the state of New York, on site at all times to personally supervise the electrical work, and shall be acceptable by the Architect and Owner, prior to commencing any electrical work.

END OF SECTION

SECTION 260024

ELECTRICAL TRENCHING, BACKFILL, AND COMPACTION

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 excavating and backfilling for underground electrical utilities and appurtenances.

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations indicated on Drawings, and the reuse or disposal of materials removed.

B. Subgrade: The undisturbed earth, or compacted soil layer, immediately below granular subbase or topsoil materials.

C. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Contracting Officer. Unauthorized excavation, as well as remedial work directed by the Contracting Officer, shall be at the Contractor's expense.

D. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Test Reports: Submit the following reports from the testing service directly to Architect, with copy to Construction Manager.

1. Field reports; in-place soil density tests.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Employ a qualified independent geotechnical engineering testing agency to preform required field testing.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Contracting Officer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

B. Explosives: Use of explosives is not permitted.

C. Protection of Persons and Property: Provide temporary barricades at open excavations occurring as part of this work.

D. Protection of Existing Trees: Protect existing trees indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising bark, or smothering of trees by stockpiling excavated materials within drip line.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation other deleterious matter.

B. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Backfill and fill Materials: Satisfactory soil materials.

D. Subbase and base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 EXECUTION

3.1 PREPARATION

A. 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.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations and from ponding on prepared subgrades.

3.3 EXCAVATION

A. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill where directed by the Contracting Officer. Place, grade, and shape stockpiles for proper drainage. Legally dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated slopes, lines, depths, and invert elevations. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

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 higher than top of pipe or conduit, unless otherwise indicated. Clearance: As indicated on Drawings.

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 stones and sharp objects to avoid point loading.

1. For pipes of conduit less than 6 inches 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 or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.

3.7 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

C. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. 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 acceptable backfill materials as shoring and bracing, and sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 COMPACTION

A. Place backfill and fill materials in layers not more then 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D1557:

1. Under driveway, compact the top 12 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
2. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill of fill material at 90 percent maximum dry density.

3.9 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency Service: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.

B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

END OF SECTION 260024

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260040

IDENTIFICATION

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of the Identification system as shown on the drawings, and/or as specified herein.

B. All items of equipment and all circuits shall be identified by color codes, tags, nameplates and directory cards as herein after specified.

1.3 COLOR CODING

A. All conductors used in the construction of the Electrical systems shall be color coded in accordance with the Article 210-5 of the NEC, latest recognized edition.

B. Where colors are not available, use black with bands of plastic tape. LOCATE BANDS WHEREVER CONDUCTORS WILL BE ACCESSIBLE. Bands shall be at least one (1) inch wide in wire ways, etc. where long lengths of wire would be accessible and banded every 2'-0". Color code all phase conductors for 120/208 volts: Black, Red and Blue with White neutral; and, for 277/480 volts: Brown, Orange and Yellow with Grey neutral.

C. Where parallel runs occur, each set of parallel conductors shall be differentiated, in addition to the previous specified color coding, by a number of one (1) inch wide bands of purple plastic tape -- one band per conductor for first set, two for second set, etc. Locate as required in "B" above for phase identification.

D. All grounding conductors shall be green or green with a yellow trace, except as allowed by Article 250-57b exception No. 1 of the NEC, latest edition.

1.4 TAGS

A. All feeder and branch circuit conductors shall be tagged in all panelboards, relay cabinets, pull boxes, and gutter spaces through which they pass. Tags shall show circuit number and panel to which the conductors are connected.

B. All tags in damp locations or where moisture damage to tags is possible, shall be made of waterproof materials, and marked in such a way that repeated contact with water will not render the tag illegible. Metal tags acceptable.

1.5 NAMEPLATES

A. Provide and install a nameplate on all equipment furnished and/or installed under this Contract. Nameplates shall also be installed by the EC on all items, such as disconnect switches, motor starters, and variable frequency drives supplied by others, for installation by EC.

B. Engraved nameplates shall be black lamacoid with white letters and attached with sheet metal screws, rivets or epoxy glue in a location so as to be visible from a normal viewing position. Do not use pressure sensitive tape to fasten nameplate. Mount nameplates indicating designation, voltage and phase on switchboards, distribution panelboards, branch circuit panelboards, and control panels with minimum 1/2" high letters. Where equipment is flush mounted in the finished areas, mount nameplates on inside of enclosure. Where disconnect switches are internally mounted in equipment, label access door "Disconnect Inside". Install labels, showing proper fuse type and size, inside all fusible safety switches and panelboard switch units.

C. Each nameplate shall clearly indicate:

1. Device function
2. Equipment served
3. Panel name
4. Circuit number
5. Voltage & Phase

All as applicable, for example:
DISCONNECT
EXHAUST FAN NO. EF-1, BOILER ROOM
PANEL A / CIRCUIT 6208 VOLT / 1 PHASE

D. Unless otherwise directed, nameplates shall be five (5) inches long by three (3) inches high for panelboards, terminal boxes, relay terminal boxes, relay cabinets, etc., and three (3) inches long and one (1) inch high for all other equipment.

1.6 LABELS

A. Provide and install a label on all wall switches and receptacles. Labels shall also be installed by the EC on all items, such as toggle switch type disconnects and manual motor starters, supplied by others, for installation by EC.

B. Labels shall be adhesive back laminated tape with black letters on a clear background. Brother PT-8000 with M4991 tape, or equal. Unless otherwise directed, labels should be two (2) inches long by one 1 inch high.

C. Each label shall clearly indicate:

1. Equipment served (for switches)
2. Panel name
3. Circuit number
4. Voltage & Phase

All as applicable, switch example:
GENERAL LIGHTING
PANEL LP1 / CIRCUIT 6
277 VOLT

All as applicable, receptacle example:
DEDICATED CIRCUIT
PANEL PP1 / CIRCUIT 6,8
208 VOLT / 1 PHASE

1.7 DIRECTORY CARDS

A. Provide and install a neatly typed directory card for all panelboards.

B. For panelboards, directory cards shall contain a list of circuit numbers, which shall correspond to those listed on the plans, and a brief description of the load(s) served.

C. Circuit over-current protective devices shall be identified on the face of the panelboard with the corresponding circuit number.

D. All directory cards shall be permanently mounted in a suitable card holder built into the equipment.

E. The EC shall assume responsibility for the accuracy of any and all directory cards, and shall correct any errors by preparing NEW CARDS. Crossing out data, erasures, etc., will not be acceptable.

F. Where circuits are added to existing panelboards, provide new directory cards as specified above for new panelboards.

G. A copy of all directory cards shall be included in the operating manual previously specified.

1.8 SPECIAL SYSTEMS

A. All conductors associated with any and/or all special systems to be installed under this Contract, shall be color coded.

B. Color coding shall be in accordance with the system manufacturer's standards, or, if such standards do not exist, the EC shall submit a scheme to the Architect and Engineer for their review prior to system installation.

C. The colors green, and green with yellow trace, shall be reserved for grounding conductors; any other combination of colors and traces shall be permissible for coding conductors.

D. In multiconductor cables, in lieu of color conductors, the EC, MAY use cables where each conductor insulation is stamped with a unique number at least every six inches. Such identification shall not be confined to areas where sheath has been removed but shall extend the full length of the conductors.

E. Color coding shall be of such an extent that each conductor located in the same conduit, pull box, junction box, cabinet, etc., shall have a unique color code. However, conductors supplying similar functions to different areas of the project should have similar (not identical) color codes (e.g., differentiated by number of traces).

F. All panels, equipment, pull boxes, and conduit shall have voltage labels such as Panduit part # PCV, or equal.

END OF SECTION 260040

SECTION 260110
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 and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

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 Corp.
   b. Western Tube & Conduit Corp.
   c. Wheatland Tube Co.
   d. Or equal.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. EMT: Comply with ANSI C80.3 and UL 797.
6. FMC: Comply with UL 1; zinc-coated steel or aluminum.
7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal 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. Cooper/Crouse-Hinds.
   b. OZGedney Co.
   c. Thomas & Betts Corp.
   d. Or equal.

2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Fittings for EMT:

   a. Material: Steel.
   b. Type: Compression.

6. 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.

C. Joint Compound for IMC, GRC, or ARC: 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 RIGID NONMETALLIC CONDUITS AND FITTINGS

A. Rigid Nonmetallic Conduit:

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. Cantex, Inc.
    b. Carlon.
    c. National Pipe & Plastic Inc.
    d. Or equal.

2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Fiberglass:

    a. Comply with NEMA TC 14.
    b. Comply with UL 2515 for aboveground raceways.
    c. Comply with UL 2420 for belowground raceways.

4. ENT: NOT PERMITTED..
5. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
6. LFNC: Comply with UL 1660.

B. Nonmetallic 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. Cantex, Inc.
    b. Carlon.
    c. National Pipe & Plastic Inc.
    d. Or equal.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

    a. Fittings for LFNC: Comply with UL 514B.

4. Solvents and Adhesives: As recommended by conduit manufacturer.

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. Mono-Systems Inc.
2. Thomas & Betts Corp.
3. Wiremold Co.
4. Or equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4X or Type 12 as specified on contract drawing.

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 for NEMA 1, 3R & 12 and Flanged-and-gasketed type for NEMA 4X wireways.

E. Finish: Manufacturer's standard enamel finish.

2.4 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. Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.
2. Eaton (Crouse-Hinds).
3. Hubbell Incorporated.
4. Or equal.

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 or aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Provide as specified in section 260140 "Wiring Devices".

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, [cast aluminum] [galvanized, cast iron] with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Minimum Device Box Dimensions: 21-Gang = 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) Single Gang = 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep). Adjust box dimensions to suite installation.

L. Gangable boxes are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4X or Type 12 as specified on contract drawing.

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.

N. Cabinets:

1. NEMA 250, Type 1 unless otherwise indicated**,** 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.

O. CORROSION RESISTANT BOXES

1. Plastic Coated Outlet and Junction Boxes: Threaded type malleable iron boxes coated with 40 mils thick polyvinylchloride coating.
2. Non-Metallic Junction and Pullboxes: Glass fiber reinforced polyester.

2.5 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. Tier 22 rated, 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. Oldcastle Enclosure Solutions.
c. Quazite; Hubbell Incorporated, Power Systems.
d. Or equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with **open** bottom unless otherwise indicated.
4. Cover: Tier 22 rated, 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."**] <**Insert legend**>.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.6 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.

2.7 NAMEPLATES AND TAGS

A. General: Precision engraved letters and numbers with uniform margins, character size minimum 3/16 inch high.

1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC, IMC, EMT .
3. Underground Conduit: RNC, Type EPC-40-PVC concrete encased, UON.
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 4X.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT
2. Exposed and Subject to Physical Damage: GRC Raceway locations include the following:
   a. Mechanical rooms.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) 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
2. EMT: Use compression, steel 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 nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C) .

3.2 INSTALLATION

A. Comply with requirements in Section 260190 "Supporting Devices" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. 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 (300 mm) of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Raceways Embedded in Slabs is prohibited:

M. Concealed Stub-Ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. 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.

O. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

P. 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 (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

Q. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

R. 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.

S. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

U. 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.

V. 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.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
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 (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) 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 (0.06 mm per meter of length of straight run per deg C) 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 (0.0115 mm per meter of length of straight run per deg C) 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.

X. Concealed Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) 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 or LFNC in damp or wet locations not subject to severe physical damage.

Y. 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 center of box unless otherwise indicated.

Z. 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.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. 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.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

GG. Number of Raceways: Do not change number of raceways to less than the number indicated on the drawings.

1. Each raceway shall enclose one circuit unless otherwise indicated on the drawings.

HH. Raceway Schedule:

1. Rigid Ferrous Metal Conduit: Install in all locations unless otherwise specified or indicated on the drawings.
2. Intermediate Ferrous Metal Conduit: May be installed in all dry and damp locations except:

    a. Hazardous areas.
    b. Where other type raceways are specified or indicated on the drawings.

3. Electrical Metallic Tubing:

    a. May be installed concealed as branch circuit conduits above suspended ceilings where conduit does not support fixtures or other equipment.

b. May be installed concealed as branch circuit conduits in hollow areas in dry locations, including:

1) Hollow concrete masonry units, except where cores are to be filled.
2) Drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

c. May be installed exposed as branch circuit conduits in dry non-hazardous locations at elevations over 10'-0" above finished floor where conduit does not support fixtures or other equipment.

4. Flexible Metal Conduit: Install equipment grounding conductor in the flexible metal conduit and bond at each box or equipment to which conduit is connected:

a. Use for final conduit connection to recessed lighting fixtures in suspended ceilings. Use 4 to 6 feet of flexible metal conduit (minimum size 1/2 inch) between junction box and fixture. Locate junction box at least 1 foot from fixture and accessible if the fixture is removed.
b. Use 1 to 3 feet of flexible metal conduit for final conduit connection to:

1) Emergency lighting units.
2) Dry type transformers.
3) Motors with open, drip-proof or splash-proof housings.
4) Equipment subject to vibration (dry locations).
5) Equipment requiring flexible connection for adjustment or alignment (dry locations).

c. May be installed concealed as branch circuit conduits in drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

5. Liquid-tight Flexible Metal Conduit: Install equipment grounding conductor in liquid-tight flexible metal conduit and bond at each box or equipment to which conduit is connected:

a. Use 1 to 3 feet of liquid-tight flexible metal conduit (UL listed and marked suitable for the installation's temperature and environmental conditions) for final conduit connection to:

1) Motors with weather-protected or totally enclosed housings.
2) Equipment subject to vibration (damp and wet locations).
3) Equipment requiring flexible connection for adjustment or alignment (damp and wet locations).

6. Wireways: May be used indoors in dry locations for exposed raceway between grouped, wall mounted equipment.

II. Box Schedule for Concealed Conduit System:

1. Non-Fire Rated Construction:

a. Depth: To suit job conditions and comply with NFPA 70 Article 370.
b. For Lighting Fixtures: Use galvanized steel outlet boxes designed for the purpose.

1) For Fixtures Weighing 50 lbs. or Less: Box marked "FOR FIXTURE SUPPORT".
2) For Fixtures More Than 50 lbs: Box listed and marked with the weight of the fixture to be supported (or support fixture independent of the box).

c. For Junction and Pull Boxes: Use galvanized steel boxes with flush covers.
d. For Switches, Receptacles, Etc:

1) Plaster or Cast-In-Place Concrete Walls: Use 4 inch or 4-11/16 inch galvanized steel boxes with device covers.
2) Walls Other Than Plaster or Cast-In-Place Concrete: Use type of galvanized steel box which will allow wall plate to cover the opening made for the installation of the box.

2. Recessed Boxes in Fire Rated (2 hour maximum) Bearing and Nonbearing Wood or Steel Stud Walls (Gypsum Wallboard Facings):

a. Use listed single and double gang metallic outlet and switch boxes. The surface area of individual outlet or switch boxes shall not exceed 16 square inches.
b. The aggregate surface area of the boxes shall not exceed 100 square inches per 100 square feet of wall surface.
c. Securely fasten boxes to the studs. Verify that the opening in the wallboard facing is cut so that the clearance between the box and the wallboard does not exceed 1/8 inch.
d. Separate boxes located on opposite sides of walls or partitions by a minimum horizontal distance of 24 inches. This minimum separation distance may be reduced when wall opening protective materials are installed according to the requirements of their classification.
e. Use wall opening protective material in conjunction with boxes installed on opposite sides of walls or partitions of staggered stud construction in accordance with the classification requirements for the protective material.

3. Other Fire Rated Construction: Use materials and methods to comply with the listing requirements for the classified construction. Conduits Penetrating Concrete Floor Slabs (Concrete slabs that are both ceilings and floors shall be treated as floor slabs):

a. Provide a minimum of 2 inches between conduits that vertically penetrate elevated concrete slabs.

JJ. Conduit Installed Exposed:

1. Install conduit exposed where indicated on the drawings. If not indicated, conduit may be installed exposed, as approved, in:

a. Unfinished spaces, and finished spaces housing mechanical or electrical equipment that is generally accessible only to facility maintenance personnel.
b. Areas where existing conduits have been installed exposed.
c. Areas where conduit cannot be installed concealed.

2. Install conduit tight to the surface of the building construction. Exception:

a. Where otherwise indicated or directed.

3. Install vertical runs perpendicular to the floor.
4. Install runs on the ceiling perpendicular or parallel to the walls.
5. Install horizontal runs parallel to the floor.
6. Do not run conduits near heating pipes.
7. Installation of conduit directly on the floor will not be permitted.

KK. Box Schedule for Exposed Conduit System:

1. Dry and Damp Locations: Use zinc electroplate or hot dipped galvanized threaded type malleable iron or cast iron alloy outlet, junction, and pullboxes or conduit bodies provided with a volume marking in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.

a. Galvanized steel boxes may be used in conjunction with conduit sizes over 1 inch in non-hazardous dry and damp locations.
b. Galvanized steel boxes may be used in conjunction with electrical metallic tubing where it is allowed (specified) to be installed exposed as branch circuit conduits at elevations over 10'-0" above finished floor.

2. Wet Locations: Use threaded type malleable iron or cast iron alloy outlet junction, and pullboxes or conduit bodies (provided with a volume marking) with hot dipped galvanized or other specified corrosion resistant coating in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.

a. Use corrosion resistant boxes in conjunction with plastic coated rigid ferrous metal conduit.

3. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Equipment Used with Exposed Raceway):

a. Use finishing collar where surface mounted equipment is installed on an exposed raceway outlet box and the equipment base is larger than the outlet box.
b. Use combination finishing collar/outlet box where surface mounted equipment is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into equipment body due to equipment design.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Concrete Encased Buried Conduit:

1. Refer to Specification Section 260375 Underground Conduit..

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 gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) 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 minimum 2" below finished grade, and provide marker "stone" as indicated on contract drawings..

D. 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.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies, meeting or exceeding fire rating of wall or floor assembly as indicated on Architectural contract documents.

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 260120

WIRING, GENERAL - 600 VOLTS AND UNDER

PART 1 GENERAL

1.1 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to Shop Drawings.

B. Product Data: Catalog sheets, specifications and installation instructions.

1.2 PRODUCT DELIVERY

A. Mark and tag insulated conductors and cables for delivery to the site. Include:
1. Contractor's name.
2. Project title and number.
3. Date of manufacture (month & year).
4. Manufacturer's name.
5. Data which explains the meaning of coded identification (UL assigned electrical reference numbers, UL assigned combination of color marker threads, etc.).
6. Environmental suitability information (listed or marked "sunlight resistant" where exposed to direct rays of sun; wet locations listed/marked for use in wet locations; other applications listed/marked suitable for the applications).

PART 2 PRODUCTS

2.1 INSULATED CONDUCTORS AND CABLES

A. Date of Manufacture: No insulated conductor more than one year old when delivered to the site will be acceptable.

B. Acceptable Companies: General Cable, Southwire, Okanite, Cerro Wire

C. Conductors: Annealed uncoated copper or annealed coated copper in conformance with the applicable standards for the type of insulation to be applied on the conductor. Conductor sizes No. 8 and larger shall be stranded.

D. Types:
1. Electric Light and Power Wiring:
a. General: Rated 600V, NFPA 70 Type THHN/THWN-2 or XHHW-2.

b. THHN/THWN-2 Gasoline and Oil Resistant: Polyvinylchloride insulation rated 600 V with nylon jacket conforming to UL requirements for type THHN/THWN-2 insulation, with the words "GASOLINE AND OIL RESISTANT II" marked thereon.

c. USE-2: Dual rated heat and moisture resistant insulation rated 600 V with jacket or dual purpose insulation/protective covering conforming to UL requirements for type USE-2 service entrance cables.

d. Metal-Clad Cable, NFPA 70 Article 330 Type MC:

1) Interlocked flexible galvanized steel armor sheath, conforming to UL requirements for type MC metal clad cable.

2) Insulated copper conductors, suitable for 600 volts, rated 90°C, one of the types listed in NFPA 70 Table 310.13(A) or of a type identified for use in Type MC cable.

3) Internal full size copper ground conductor with green insulation.

4) Acceptable Companies: Southwire, AFC Cable, General Cable

5) Connectors for MC cable: AFC Fitting Inc.'s AFC Series, Arlington Industries Inc.'s Saddle grip, or Thomas & Betts Co.'s Tite-Bite with anti-short bushings.

1. Class 1 Wiring:

a. No. 18 and No. 16 AWG: Insulated copper conductors suitable for 600 volts, NFPA 70 types KF-2, KFF-2, PAFF, PF, PFF, PGF, PGFF, PTFF, SF-2, SFF-2, TF, TFF, TFN, TFFN, ZF, or ZFF.

b. Larger than No. 16 AWG: Insulated copper conductors suitable for 600 volts, in compliance with NFPA 70 Article 310.

c. Conductor with other types and thickness of insulation may be used if listed for Class 1 circuit use.

2. Class 2 Wiring:

a. Multiconductor Cables: NFPA 70 Article 725, Types CL2P, CL2R, CL2.

b. Other types of cables may be used in accordance with NFPA 70 Table 725.154(G) "Cable Substitutions", as approved.

3. Class 3 Wiring:

a. Single Conductors No. 18 and No. 16 AWG: Same as Class 1 No. 18 and No. 16 AWG conductors except that:

1) Conductors are also listed as CL3.

2) Voltage rating not marked on cable except where cable has multiple listings and voltage marking is required for one or more of the listings.

b. Multiconductor Cables: NFPA 70 Article 725, Types CL3P,

1) CL3R, CL3.

c. Other types of cables may be used in accordance with NFPA 70, Table 725.154(G) "Cable Substitutions", as approved.

2.2 ELECTRICAL CIRCUIT PROTECTIVE SYSTEM

A. Minimum 1-Hour Fire Rating: A system listed in UL Building Materials Directory, product category Electrical Circuit Protective Systems (FHIT).

2.3 CONNECTORS

A. General:
1. Connectors specified are part of a system. Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system.
2. Connectors shall be UL 486 A listed, or UL 486 B listed for combination dual rated copper/aluminum connectors (marked AL7CU for 75 degrees C rated circuits and AL9CU for 90 degrees C rated circuits).

B. Splices:
1. Spring Type:
a. Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s B-Cap, Electrical Products Div./3M's Scotchlok Type Y, R, G, B, O/B+, R/Y+, or B/G+, or Ideal Industries Inc.'s Wing Nuts or Wire Nuts.
b. Rated 150° C, 600V; Ideal Industries Inc.'s High Temperature Wire-Nut Model 73B, 59B.
2. Indent Type with Insulating Jacket:
a. Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s Crimp Connectors, Ideal Industries Inc.'s Crimp Connectors, Penn-Union Corp.'s Penn-Crimps, or Thomas & Betts Corp.'s STA-KON.
3. Indent Type (Uninsulated): Anderson/Hubbell's Versa-Crimp, VERSAtile, Blackburn/T&B Corp.'s Color-Coded Compression Connectors, Electrical Products Div./3M's Scotchlok 10000, 11000 Series, Burndy's Hydent, Penn-Union Corp.'s BCU, BBCU Series, or Thomas & Betts Corp.'s Compression Connectors.
4. Connector Blocks: NIS Industires Inc.'s Polaris System, or Thomas & Betts Corp.'s Blackburn AMT Series.
5. Resin Splice Kits: Electrical Products Div./3M's Scotchcast Brand Kit Nos. 82A Series, 82-B1 or 90-B1, or Scotchcast Brand Resin Pressure Splicing Method.
6. Heat Shrinkable Splices: Electrical Products Div./3M's ITCSN, Raychem Corp.'s Thermofit Type WCS, or Thomas & Betts Corp.'s SHRINK-KON Insulators.
7. Cold Shrink Splices: Electrical Products Div./3M's 8420 Series.

C. Gutter Taps: Anderson/Hubbell's GP/GT with GTC Series Covers, Blackburn/T&B Corp.'s H-Tap Type CF with Type C Covers, Burndy's Polytap KPU-AC, H-Crimpit Type YH with CF-FR Series Covers, ILSCO's GTA Series with GTC Series Covers, Ideal Industries Inc.'s Power-Connect GP, GT Series with GIC covers, NSI Industries Inc.'s Polaris System, OZ/Gedney Co.'s PMX or PT with PMXC, PTC Covers, Penn-Union Corp.'s CDT Series, or Thomas & Betts Corp.'s Color-Keyed H Tap CHT with HTC Covers.

D. Terminals: Nylon insulated pressure terminal connectors by Amp-Tyco/Electronics, Electrical Products Div./3M, Burndy, Ideal Industries Inc., Panduit Corp., Penn-Union Corp., Thomas & Betts Corp., or Wiremold Co.

E. Lugs:
1. Single Cable (Compression Type Lugs): Copper, one or 2 hole style (to suit conditions), long barrel; Anderson/Hubbell's VERSAtile VHCL, Blackburn/T&B Corp.'s Color-Coded CTL, LCN, Burndy's Hylug YA, Electrical Products Div./3M Scotchlok 31036 or 31145 Series, Ideal Industries Inc.'s CCB or CCBL, NSI Industries Inc.'s L, LN Series, Penn-Union Corp.'s BBLU Series, or Thomas & Betts Corp.'s 54930BE or 54850BE Series.
2. Single Cable (Mechanical Type Lugs): Copper, one or 2 hole style (to suit conditions); Blackburn/T&B Corp.'s Color-Keyed Locktite Series, Burndy's Qiklug Series, NSI Industries Inc.'s Type TL, Penn-Union Corp.'s VI-TITE Terminal Lug Series, or Thomas & Betts Corp.'s Locktite Series.
3. Multiple Cable (Mechanical Type Lugs): Copper, configuration to suit conditions; Burndy's Qiklug Series, NSI Industries Inc.'s Type TL, Penn-Union Corp.'s VI-TITE Terminal Lug Series, or Thomas & Betts Corp.'s Color-Keyed Locktite Series.

2.4 TAPES

A. Insulation Tapes:
1. Plastic Tape: Electrical Products Div./3M's Scotch Super 33+ or Scotch 88, Plymouth Rubber Co.'s Plymouth/ Bishop Premium 85CW.
2. Rubber Tape: Electrical Products Div./3M's Scotch 130C, or Plymouth Rubber Co.'s Plymouth/Bishop W963 Plysafe.

B. Moisture Sealing Tape: Electrical Products Div./3M's Scotch 2200 or 2210, or Plymouth Rubber Co.'s Plymouth/Bishop 4000 Plyseal-V.

C. Electrical Filler Tape: Electrical Products Div./3M's Scotchfil, or Plymouth Rubber Co.'s Plymouth/Bishop 125 Electrical Filler Tape.

D. Color Coding Tape: Electrical Products Div./3M's Scotch 35, or Plymouth Rubber Co.'s Plymouth/Bishop Premium 37 Color Coding.

E. Arc Proofing Tapes:
1. Arc Proofing Tape: Electrical Products Div./3M's Scotch 77, Mac Products Inc.'s AP Series, or Plymouth Rubber Co.'s Plymouth/Bishop 53 Plyarc.
2. Glass Cloth Tape: Electrical Products Div./3M's Scotch 27/Scotch 69, Mac Products Inc.'s TAPGLA 5066,, or Plymouth Rubber Co.'s Plymouth/Bishop 77 Plyglas.
3. Glass-Fiber Cord: Mac Products Inc's MAC 0527.

2.5 WIRE-PULLING COMPOUNDS

A. To suit type of insulation; American Polywater Corp.'s Polywater Series, Electric Products Div./3M's WL, WLX, or WLW, Greenlee Textron Inc.'s, Cable Cream, Cable Gel, Winter Gel, Ideal Industries Inc.'s Yellow 77, Aqua-Gel II, Agua-Gel CW, or Thomas & Betts Corp.'s Series 15-230 Cable Pulling Lubricants, or Series 15-631 Wire Slick.

2.6 TAGS

A. Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inches high.
   1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
   2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.

2.7 WIRE MANAGEMENT PRODUCTS

A. Cable Clamps and Clips, Cable Ties, Spiral Wraps, etc: Catamount/T&B Corp., or Ideal Industries Inc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install conductors in raceways after the raceway system is completed. Exceptions: Type MC or other type specifically indicated on the drawings not to be installed in raceways.

B. No grease, oil, or lubricant other than wire-pulling compounds specified may be used to facilitate the installation of conductors.

3.2 CIRCUITING

A. Do not change, group or combine circuits other than as indicated on the drawings.

3.3 COMMON NEUTRAL CONDUCTOR

A. A common neutral may be used for 2 or 3 branch circuits where the circuits are indicated on the drawings to be enclosed within the same raceway, provided each branch circuit is connected to different phase busses in the panelboard.

B. Exceptions - The following circuits shall have a separate neutral:
   1. Circuits containing ground fault circuit interrupter devices.
   2. Circuits containing solid state dimmers.

3. Circuits recommended by equipment manufacturers to have separate neutrals.

3.4 CONDUCTOR SIZE

A. Conductor Size:
1. For Electric Light and Power Branch Circuits: Install conductors of size shown on drawings. Where size is not indicated, the minimum size allowed is No. 12 AWG.
2. For Class 1 Circuits:

B. No. 18 and No. 16 AWG may be used provided they supply loads that do not exceed 6 amps (No. 18 AWG), or 8 amps (No. 16 AWG).

C. Larger than No. 16 AWG: Use to supply loads not greater than the ampacities given in NFPA 70 Section 310.15.

For Class 2 Circuits: Any size to suit application.

For Class 3 Circuits: Minimum No. 18 AWG.

3.5 COLOR CODING

A. Color Coding for 120/208 Volt Electric Light and Power Wiring:
1. Color Code:
a. 2 wire circuit - black, white.
b. 3 wire circuit - black, red, white.
c. 4 wire circuit - black, red, blue, white.
2. White to be used only for an insulated grounded conductor (neutral). If neutral is not required use black and red, or black, red and blue for phase to phase circuits.
a. "White" for Sizes No. 6 AWG or Smaller:
1) Continuous white outer finish, or:
2) Three continuous white stripes on other than green insulation along its continuous length.
b. "White" for Sizes Larger Than No. 6 AWG:
1) Continuous white outer finish, or:
2) Three continuous white stripes on other than green insulation along its continuous length, or:
3) Distinctive white markings (color coding tape) encircling the conductor, installed on the conductor at time of its installation. Install white color coding tape at terminations, and at 1' 0" intervals in gutters, pullboxes, and manholes.
3. Colors (Black, Red, Blue):
a. For Branch Circuits: Continuous color outer finish.
b. For Feeders:
1) Continuous color outer finish, or:
2) Color coding tapes encircling the conductors, installed on the conductors at time of their installation. Install color coding tapes at terminations, and at 1' 0" intervals in gutter, pullboxes, and manholes.

B. More Than One Nominal Voltage System Within A building: Permanently post the color coding scheme at each branch-circuit panelboard.

C. Color Code For Wiring Other Than Electric Light and Power: In accordance with ICEA standard S-73-532 (NEMA WC57-2004). Other coding methods may be used, as approved.

3.6 IDENTIFICATION

A. Identification Tags: Use tags to identify feeders and designated circuits. Install tags so that they are easily read without moving adjacent feeders or requiring removal of arc proofing tapes. Attach tags with non-ferrous wire or brass chain.
   1. Interior Feeders: Identify each feeder in pullboxes and gutters. Identify by feeder number and size.
   2. Exterior Feeders: Identify each feeder in manholes and in interior pullboxes and gutters. Identify by feeder number and size, and also indicate building number and panel designation from which feeder originates.
   3. Street and Grounds Lighting Circuits: Identify each circuit in manholes and lighting standard bases. Identify by circuit number and size, and also indicate building number and panel designation from which circuit originates.

B. Identification Plaque: Where a building or structure is supplied by more than one service, or has any combination of feeders, branch circuits, or services passing through it, install a permanent plaque or directory at each service, feeder and branch circuit disconnect location denoting all other services, feeders, or branch circuits supplying that building or structure or passing through that building or structure and the area served by each.

3.7 WIRE MANAGEMENT

A. Use wire management products to bundle, route, and support wiring in junction boxes, pullboxes, wireways, gutters, channels, and other locations where wiring is accessible.

3.8 EQUIPMENT GROUNDING CONDUCTOR

A. Install equipment grounding conductor:
   1. Where specified in other Sections or indicated on the drawings.
   2. In conjunction with circuits recommended by equipment manufacturers to have equipment grounding conductor.

B. Equipment grounding conductor is not intended as a current carrying conductor under normal operating circumstances.

C. Color Coding For Equipment Grounding Conductor:
1. Color Code: Green.
2. "Green" For sizes No. 6 AWG or Smaller:
   a. Continuous green outer finish, or:
   b. Continuous green outer finish with one or more yellow stripes, or:
   c. Bare copper (see exception below).
3. "Green" For Sizes Larger Than No. 6:
   a. Stripping the insulation or covering from the entire exposed length (see exception below).
   b. Marking the exposed insulation or covering with green color coding tapes.
   c. Identify at each end and at every point where the equipment grounding conductor is accessible.
4. Exception For use of Bare Copper: Not allowed for use where NFPA 70 specifically requires equipment grounding conductor to be insulated, or where specified in other Sections or indicated on the drawings to be insulated.

3.9 SPECIAL GROUNDING CONDUCTORS

A. Technical Power System Grounding (Equipment grounding conductor isolated from the premises grounded conductor except at a single grounded termination point): Install an insulated grounding conductor running with the circuit conductors for isolated receptacles or utilization equipment requiring an isolated ground:
1. Color Code: Green.
2. "Green" For Isolated Grounding Conductor:
   a. Continuous green outer finish, or:
   b. Continuous green outer finish with one or more yellow stripes, and:
   c. Different than the "green" used for the equipment grounding conductor run with the circuit (where required).
3. Install label at every point where the conductor is accessible, identifying it as an "Isolated Grounding Conductor".

3.10 ARC PROOFING

A. Where indicted on the drawings, arc proof feeders installed in a common pullbox or manhole as follows:
1. Arc proof new feeders.
2. Arc proof existing feeders that are spliced to new feeders.
3. Arc proof each feeder as a unit (except feeders consisting of multiple sets of conductors).
4. Arc proof feeders consisting of multiple sets of conductors by arc proofing each set of conductors as a unit.
5. Arc proof feeders with half-lapped layer of 55 mils thick arc proofing tape and random wrapped or laced with glass cloth tape or glass-fiber cord. For arc proofing tape less than 55 mils thick, add layers to equivalent of 55 mils thick arc proofing tape.

3.11 INSULATED CONDUCTOR AND CABLE SCHEDULE - TYPES AND USE

A. Electric Light and Power Circuits:

1. Type THHN/THWN-2 or XHHW-2. : Wiring in dry or damp locations (except where special type insulation is required).
2. THHN/THWN-2, XHHW-2, or USE-2: Wiring in wet locations (except where type USE-2 insulated conductors are specifically required, or special type insulation is required).
3. THHN/THWN-2: Wiring installed in existing raceway systems (except where special type insulation is required).
4. THHN/THWN-2 or XHHW-2: Wiring for electric discharge lighting circuits (fluorescent, HID), except where fixture listing requires wiring rated higher than 90° C.
5. THHN/THWN-2 Marked "Gasoline and Oil Resistant": Wiring to gasoline and fuel oil pumps.
6. USE-2 Marked "Sunlight Resistant":
   a. Service entrance wiring from overhead service to the service equipment.
   b. Wiring exposed to the weather and unprotected (except where special type insulation is required).
7. MC:
   a. All MC Cable is to be concealed. Maximum lengths shall be 6'-0" in ceilings or as required from fixture to fixture or device to device. Metal-clad cable shall be used in dry locations; concealed in walls and above ceilings only.
   b. Route MC Cable in a direct line, with long sweep bends and offsets. Route MC Cable parallel to or perpendicular to building lines.
   c. Support MC Cable with brackets, straps or trapeze hangers suitably anchored to building structure. Where MC Cable is run above a lay-in ceiling, do not support the cable from the ceiling support system. Maintain a minimum of 6" clearance from flues, steam pipes and hot water lines.
   d. MC Cable shall be continuous from enclosure to enclosure and terminated with appropriate connectors to ensure electrical continuity throughout the raceway system.
   e. All home runs to panels for MC Cable branch circuits shall be in conduit. Minimum size conduit shall be ¾" and all home run conduit shall be sized to carry one (1) additional future circuit. "HOMERUN" is defined as any circuit collecting branches in walls, light fixtures, etc. and running to panelboard circuit breaker.
   f. Install junction boxes with screw covers where required to facilitate installation of MC Cable and to keep cable lengths to a minimum. Size in accordance with N.E.C., mount in an accessible location and label cover with circuit numbers and destination.
   g. MC Cable shall not be used underground or penetrate through roofs, floors, concrete walls, etc.

h. MC Cable installation shall be allowed for branch receptacle and lighting circuits concealed within GWB wall construction. Single multi-wire (multi-circuit) cables cannot be used.

i. MC Cable shall not be allowed for motor circuits, feeders or special equipment. These circuits shall be run in conduit and sealtite.

B. Class 1 Circuits: Use Class 1 wiring specified in Part 2 (except where special type insulation is required).

C. Class 2 Circuits: Use Class 2 wiring specified in Part 2 (except where special type insulation is required).

D. Class 3 Circuits: Use Class 3 wiring specified in Part 2 (except where special type insulation is required).

3.12 CONNECTOR SCHEDULE - TYPES AND USE

A. Temperature Rating: Use connectors that have a temperature rating, equal to, or greater than the temperature rating of the conductors to which they are connected.

B. Splices:

1. Dry Locations:

a. For Conductors No. 8 AWG or Smaller: Use spring type pressure connectors, indent type pressure connectors with insulating jackets, or connector blocks (except where special type splices are required).

b. For Conductors No. 6 AWG or Larger: Use connector blocks or uninsulated indent type pressure connectors. Fill indentions in uninsulated connectors with electrical filler tape and apply insulation tape to insulation equivalent of the conductor, or insulate with heat shrinkable splices or cold shrink splices.

c. Gutter Taps in Panelboards: For uninsulated type gutter taps fill indentions with electrical filler tape and apply insulation tape to insulation equivalent of the conductor, or insulate with gutter tap cover.

2. Damp Locations: As specified for dry locations, except apply moisture sealing tape over the entire insulated connection (moisture sealing tape not required if heat shrinkable splices or cold shrink splices are used).

3. Wet Locations: Use uninsulated indent type pressure connectors and insulate with resin splice kits, cold shrink splices or heat shrinkable splices.
Exception: Splices above ground which are totally enclosed and protected in NEMA 3R, 4, 4X enclosures may be spliced as specified for damp locations.

C. Terminations:
   1. For Conductors No. 10 AWG or Smaller: Use terminals for:
      a. Connecting wiring to equipment designed for use with terminals.
   2. For Conductors No. 8 AWG or Larger: Use compression or mechanical type lugs for:
      a. Connecting cables to flat bus bars.
      b. Connecting cables to equipment designed for use with lugs.
   3. For Conductor Sizes Larger Than Terminal Capacity On Equipment: Reduce the larger conductor to the maximum conductor size that terminal can accommodate (reduced section not longer than one foot). Use compression or mechanical type connectors suitable for reducing connection.

END OF SECTION

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260140

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of Wiring Devices as shown on the contract documents, and/or as specified herein.

B. Wiring devices are to consist of, but are not limited to, wall switches, ground type, polarized receptacles, and face plates and special wiring devices as indicated and/or specified.

1.3 QUALITY ASSURANCE

A. UL Compliance and Labeling: Provide electrical wiring devices which have been UL-listed and labeled.

B. NEC Compliance: Comply with NEC as applicable to construction & installation of electrical wiring devices.

C. NEMA Compliance: Comply with NEMA standards for general-and specific-purpose wiring devices.

a. Electrical Raceways and Components: Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to raceways and components. Listed and labeled in accordance with NFPA 70, Article 100.

b. Floor box assembly shall be investigated and approved by a Nationally Recognized Testing Laboratory for suitability in the country of installation. Investigation shall include:

1. Scrub water exclusion test per UL891 and UL514A, Section 32A.2.
2. Compliance with NFPA 70 (NEC).
3. cULus Listed as metallic outlet boxes for tile, terrazzo, carpet, and wood floors; File E2961, Guide QCIT.

PART 2 PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers

Hubbell
Leviton
Pass and Seymour

B. Wall Switches:

1. All wall switches shall be similar in appearance, toggle type, federal specification grade, color as selected by the Architect. Provide ivory color unless otherwise noted.
2. Unless otherwise directed, equip each line voltage switch outlet with a switch of capacity and rating required for the load controlled as listed below:

Load (watts)	Capacity (amps)	Rating (volts)
1-1800	20	120/277
1801-3000	30	120/277

3. Remote Control Low Voltage: Provide general-duty flush single-pole double-throw switches, 3-ampere, 28 volts AC, with mounting clips for snap-in panel mounting, and backwired quick disconnect blade terminals.
4. Provide pilot-light switches where indicated on the plans. Switch to be single pole, 125 VAC, 20 Ampere, federal specification grade, with illuminated toggle in the "ON" position for visual load monitoring.
5. Cover Plates: Installation:
   a. Provide smooth nylon cover plates in occupied areas, color to match device and as selected by the Architect.
   b. Provide smooth stainless steel 302/304 cover plates in unoccupied areas such as closets and maintenance rooms.
   c. Provide smooth stainless steel 302/304 cover plate on each device box installed in fire rated construction and shop classrooms such as wood shop and metal shop.

C. Convenience Outlets:

1. Equip each location indicated on the plans with a federal specification grade duplex convenience outlet rated at 20 amperes NEMA 5-20R, with USB type A and C receptacles. Provide ivory color unless otherwise noted. Install at points as shown on contract documents. Refer to contract drawings electrical detail sheets for floor box receptacle types.
   a. Provide smooth nylon cover plates in occupied areas, color to match device and as selected by the Architect.
   b. Provide smooth stainless steel 302/304 cover plates in unoccupied areas such as Mechanical, Electrical and maintenance rooms.

2. Ground Fault Circuit Interrupter Receptacles: Provide federal specification grade, GFCI duplex receptacles, 20 ampere, 125 volt, 2 pole 3 wire grounding type, per UL 2003 standards 943 Class A and 498. In residential applications provide UL listed tamper resistant GFCI duplex receptacle, rated 20 ampere, 125 volt, 2-pole 3-wire grounding specification grade. Exterior applications provide weather resistant and tamper resistant GFCI duplex receptacles rated 20 ampere, 125 volt, 2-pole 3-wire grounding specification grade.
3. Surge Suppression Receptacles: As noted on the contract documents. Provide federal specification grade surge suppression receptacles, 20 ampere, 125 volt, 2 pole 3 wire grounding type, with indicator light and audio alarm, 210 joules/13000A per mode rating, listed by UL.
4. "Weatherproof" (WP) Receptacles: As noted on the contract documents. Provide ground fault circuit protected receptacle in "Raintite" box and in-use cover assembly, per NEC 410-57(b) and listed by UL. The receptacle shall remain weatherproof with the plug(s) inserted.
5. Quadraplex Receptacles: As noted on the contract documents. Provide two (2) duplex receptacles in a single 4" x 4" device box, 20 ampere, 125 volt, 1 phase 3 wire grounding type, Nema 5-20R, UL listed, federal specification grade. Single Faceplate.
6. Telephone Wall Service Outlets: Provide 2" x 4" galvanized coated flat rolled sheet-steel non-gangable device box with single gang mud ring. One (1) 3/4" EMT stubbed up in wall above ceiling with end bushing. Telephone jack, coverplates and, cabling as specified in Div. 27 sections.
7. Data Wall Service Outlets: Provide 2" x 4" galvanized coated flat rolled sheet-steel non-gangable device box with single gang mud ring. One (1) 3/4" EMT stubbed up in wall above ceiling with end bushing. Data jacks, coverplates and, cabling as specified in Div. 27 sections.
8. Emergency Shut-down Switches (EPO): Provide 4" x 4" cast aluminum surface mounted device box with stainless steel face plate and red 1-5/8" diameter mushroom-type pushbutton control station. Provide plastic laminate engraved tag on faceplate, which reads "Emergency Shut-Down".

D. Raised Floor Boxes: (Basis-of-Design Product: The design for electrical floor boxes and fittings is based on Evolution Series Floor Boxes manufactured by Legrand/Wiremold, 60 Woodlawn Street, West Hartford, CT 06110; toll-free 800-621-0049, telephone 860-233-6251, fax 860-232-2062; Web Site: www.legrand.us/wiremold:)

6. Model EFB10S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall be painted with a fusion-bonded epoxy. Boxes shall be 15-3/16" L x 12-5/8" W x 6-1/16" H. Provide boxes with 10 independent wiring compartments that allow for up to 10 duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Six (6) of the 10 compartments shall have a minimum wiring capacity of 23-1/2-in^3. Four (4) of the 10 compartments shall have a minimum wiring capacity of 27-in^3. Each of the 10 compartments shall have a minimum depth of 3-1/2" behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 14 1-inch trade size, six (6) 1-1/4-inch trade size, and four (4) 2-inch trade size. Boxes shall be fully adjustable, accommodating a

maximum 2-inch pre-concrete pour and a maximum 1/2" post-concrete pour adjustment. Include mounting brackets with the boxes that will accommodate 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices. Refer to contract drawings for number and type of wiring devices in each floor box.

a. Provide Evolution EFB6810BT and EFB6810CT Series Covers: Manufactured of die-cast aluminum. Activation covers shall be available in flush style with carpet insert. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16-15/16" x 12-1/2" x 3/16" [430mm x 318mm x 4mm]. Covers shall be provided with a carpet recess area. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in^2, or a minimum of 8-in^2 per cover assembly. Cover finish shall be (3) durable finishes brushed aluminum, satin brass or satin nickel. Cover finish shall be determined by architect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", in accordance with recognized industry practices to fulfill project requirements, and as indicated on the contract documents and in this specification.

B. Coordinate with other Work, including painting, electrical boxes and wiring work as necessary to interface installation of wiring devices with other Work.

C. Install wiring devices only in electrical boxes which are clean and free from excess building materials, dirt, and debris. Where switches are ganged together, insulated barriers are required in switch electrical boxes between each switch.

D. Install switches at points shown on the plans to control circuits, outlets, appliances, devices, etc., as indicated.

E. Gang switches where two or more are required. Provide custom, multi-gang, cover plates as required to gang all switches at a location into a single cover plate.

F. Install all wall switches such that up is "ON" and down is "OFF".

G. Install all wall receptacles such that the grounding pin slot is facing "Down".

H. Install all wiring devices and cover plates after final painting has been completed. Clean all paint overspray off of conductor insulation so that color coding can be seen.

I. Install a bonding jumper from the grounding terminal on each receptacle (except isolated ground type) to the metal device box.

J. GFCI Type receptacles are to be installed such that any other devices "upstream" or "downstream" are not protected by the GFCI receptacle. Each receptacle indicated on the contract documents with a "GFCI" is to be an independent device.

K. Install floor service outlets such that finish trim rings or plates are flush with final floor finish, and per manufactures written instructions.

L. Install fire proofing sheet in back of each device box installed in fire rated construction. Provide metal cover plate on each device box installed in fire rated construction.

3.2 IDENTIFICATION

A. Install electrical identification in accordance with Section 260040 "Identification".

3.3 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all connections to verify manufacturer's torque tightening specifications.

B. Inspect each wiring device for defects.

C. Verify that each receptacle device is energized.

D. After energization of circuitry, check all receptacles with receptacle circuit tester to verify proper connection of ground wire and correct polarity. Test all GFCI type receptacles with a GFCI receptacle tester with a test current of 6ma. (+/- 5%).

E. Operate each wall switch with circuit energized and verify proper operation.

F. Test all receptacles for polarity, ground continuity and ground blade retention force per NFPA 99 Chapter 3-3 Section 3-3.3.3

G. Rewire receptacles as required until receptacles test properly.

END OF SECTION 260140

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260190

SUPPORTING DEVICES

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.

B. This section is a Division 26 Basic Electrical Materials and Methods section, and is a part of each Division 26 section making reference to supports, anchors, sleeves, and seals specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of supports, anchors, sleeves, seals and access doors is indicated by drawings and schedules and/or specified in other Division 26 sections. All wire and cable shall be provided with sleeves through interior and exterior walls.

B. Types of supports, anchors, sleeves and seals specified in this section include the following:

1. Clevis hangers
2. Riser clamps
3. C-clamps
4. I-beam clamps
5. One-hole conduit straps
6. Two-hole conduit straps
7. Round steel rods
8. Lead expansion anchors
9. Toggle bolts
10. Wall and floor seals
11. Roof penetration portals
12. Roof pillow block supports
13. Fire rated low voltage cable wall seals

C. Supports, anchors, sleeves and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other Division 26 sections.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

PART 2 PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES AND SLEEVES

A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option. All equipment shall be UL listed and fire rated for penetration through rated assemblies.

B. Supports: Provide supporting devices of types, sizes and materials indicated; and having the following construction features:

1. Clevis Hangers: For supporting 2" rigid metal conduit; galvanized steel; with 1/2" dia. hole for round steel rod; approximately 54 pounds per 100 units.
2. Riser Clamps: For supporting 5" rigid metal conduit; black steel; with 2 bolts and nuts, and 4" ears; approximately 510 pounds per 100 units.
3. C-Clamps: Black malleable iron: 1/2" rod size; approximately 70 pounds per 100 units.
4. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.
5. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approximately 7 pounds per 100 units.
6. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.
7. Hexagon Nuts: For 1/2" rod size; galvanized steel; approximately 4 pounds per 100 units.
8. Round Steel Rod: Black steel; 1/2" dia.; approximately 67 pounds per 100 feet.
9. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.

C. Anchors: Provide anchors of types, sizes and materials indicated, with the following construction features:

1. Lead Expansion Anchors: 1/2" approximately 38 pounds per 100 units.
2. Toggle Bolts: Springhead; 3/16" x 4"; approximately 5 lbs. per 100 units.

D. Sleeves, chases, and openings through floors, walls, ceilings and structural members shall be arranged in conjunction with the Architect and related trades to be installed in an acceptable manner. All wiring through walls or floors shall be provided with sleeves.

1. Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws. Provide UL rated assemblies for penetrations in rated walls, floors, and ceilings.
2. Seal all openings through fire-rated walls and floors after installation of conduits, cable trays, wireways, etc., in a manner to preserve fire rating of walls and floors with UL listed material.

3. Conduits passing through exterior concrete walls or footings below grade shall have a thruwall conduit entrance seal O.Z. type FSK, or equal and the assembly shall be sealed watertight with sealing compound, Johns-Manville "Duxseal" or equal.
4. The EC shall furnish and install a pipe portal system at all conduit locations which penetrate the roofing system. Each complete unit shall include a base with a molded sealing ring on a collared opening, and an EPDM compression molded rubber cap. The cap and base shall be locked with a "Weather Tite Pressure Seal". The portal shall include stainless steel clamp sealing units. All connections to the roof shall be made in accordance with the roofing manufacturer's recommendations. The pipe portal shall include a prefabricated roof curb, a laminated, acrylic coated ABS cover with pre-punched mounting holes and a double molded sealing ring on the collared opening.

   Portals Plus, Inc. RC4A, or acceptable equal

5. The EC shall furnish and install roof-to-pillow block type pipe stands for all roof mounted conduits. Pillow block shall Lexan block with metal roller seated in Teflon. Strap conduit loosely to pillow block to prevent conduit from slipping off unit. Space pillow blocks per NEC conduit support spacing requirements.

   Miro Industries 24R, or acceptable equal

6. Provide factory-assembled 3" square sleeves with integral firestopping suitable for sealing around low voltage cables passing through walls. Sleeves are to be able to be grouped together to form duplex or triplex sleeves. Provide UL rated assemblies for penetrations in rated walls, floors, and ceilings. Provide Specified Technologies Inc. "EZ-Path" fire rated pathway, or equal acceptable by Engineer.

2.2 FABRICATED SUPPORTING DEVICES

A. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal: 3" and smaller, 20-gage; 4" to 6", 16-gage; over 6", 14-gage.
2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

B. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, in exterior walls, or fire rated assemblies.

PART 3 EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES, SLEEVES, AND SEALS

A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC and ANSI/NEMA for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings indicated.

D. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

E. Install sleeves for all wire and cables, including low voltage wiring, run through interior and exterior walls and provide with proper seals to achieve rating of wall penetrated.

END OF SECTION 260190

SECTION 260195

VIBRATION ISOLATION AND SEISMIC RESTRAINTS

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.

B. This section is a Division 26 Basic Electrical Materials and Methods section, and is a part of each Division 26 section making reference to supports, anchors, vibration isolation and seismic restraints.

C. ASHRAE publication, 'A Practical Guide to Seismic Restraint'.

1.2 DESCRIPTION OF WORK

A. Vibration isolation and seismic restraints for all electrical systems including equipment, conduit, cable tray, busduct and light fixtures within the building.

B. The work of this section includes but is not limited to the following:

1. Vibration isolation elements
2. Equipment isolation bases
3. Seismic restraints for isolated and non-isolated electrical items

C. It is the intent of the seismic portion of this specification to keep all electrical building system components in place during a seismic event.

D. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.

E. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent Building Code of New York State, national or local construction requirements (i.e. California Title 24, California OSHPD or other requirements).

F. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an acceptable manner.

G. Seismic restraints shall be designed in accordance with seismic force levels as detailed in section 1.07.

1.3 QUALITY ASSURANCE

A. Manufacturers: Only firms having five years experience designing and manufacturing seismic devices shall be capable of work in this specification.

B. Comply with seismic restraint requirements in accordance with State of New York Building Code and Local Codes and Ordinances and the Authority having jurisdiction.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

1.4 SUBMITTALS

A. The submittal material shall include copies of descriptive data for all products and materials including but not limited to the following:

1. Descriptive Data:
   a. Catalog cuts and data sheets.
   b. An itemized list showing the items to be isolated and/or seismically restrained, product type or model number to be used and loading and deflection data.
   c. Seismic restraint calculations.
   d. Structural or civil engineer's seal in state where project is located verifying design and calculations for seismic restraining system used.
2. Shop Drawings:
   a. Drawings showing equipment base construction for each machine, including dimensions, structural member sizes, and support point locations.
   b. Drawings showing methods of suspension, support guides for conduit, cable tray and busduct.
   c. Drawings showing methods for isolation of conduits, cable tray and busduct penetrating walls and floor slabs.
   d. Concrete and steel details for bases including anchor bolt locations.
   e. Number location of seismic restraints and anchors for each piece of equipment.
   f. Specific details of restraints including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or conduits, cable tray and busduct locations.

1.5 GENERAL (MANUFACTURER) RESPONSIBILITIES

A. Contractor shall have the following responsibilities:

1. Determine vibration isolation and seismic restraint sizes and locations per specifications.
2. Provide and install isolation systems and seismic restraints as scheduled or specified.
3. Guarantee specified isolation system deflection.
4. Provide installation instructions, drawings and field supervision to assure proper installation and performance.

5. Substitution of "Internally Isolated" electrical equipment in lieu of the specified isolation of this section may be acceptable provided that all specified deflections and stamped seismic calculations are supplied by the equipment manufacturer.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations and installation of vibration isolators and seismic restraints including attachment points.

1.7 PROJECT CONDITIONS

A. This project is subject to the seismic bracing requirements of the 2020 Building Code of New York State. The following criteria are applicable to this project.

1. Seismic Use Group (Table 1604.5): III
2. Seismic Design Category (Table 1616.3(1)): **C**
3. Seismic Risk Category (Table 1604.5): **IV**
4. Site Class Category (Table 1613.2.2): **D**
5. Design Spectral Response Acceleration (S_{DS}, Section 1615.1.3): 0.198
   a. Site Coefficient (F_a, Table 1615.1.2(1)): 1.6
   b. Mapped Spectral Acceleration (S_S, Section 1615.1): **.186**
6. Seismic Importance Factor (I_P, Section 1621.1.6): **1.5**
7. Component Amplification Factor (a_P, Table 1621.3): Per ASCE 7-16
8. Component Response Mod. Factor (R_P, Table 1621.3): **3.0**

B. Forces shall be calculated for the above requirements and Equation 16-67, 68, & 69 in section 1621.1.4, unless exempted by 1621.1.1.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mason Industries Inc. models listed below.

B. Other acceptable manufacturers providing equivalent products include:

1. Vibration Eliminator Co.
2. Vibration Isolation Co.

2.2 SEISMIC RESTRAINT TYPES

A. General: Installations shall be designed to safely accept external forces of one-half "G" load in any direction for all rigidly supported equipment without failure and permanent displacement of the equipment. Life safety equipment such as (fire pumps, sprinkler piping and emergency generators) shall be capable of safely accepting external forces up to one "G" load in any direction without permanent displacement of the supported equipment. Seismic restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Type I (spring mount): Shall comply with general characteristics of spring isolators having a minimum o.d. to o.h. of .8 to 1 and minimum runout of 50% to solid. Shall incorporate snubbing restraint in all directions. Shall be capable of supporting equipment at a fixed elevation during equipment erection. Cast housings shall be ductile iron or aluminum. System to be field bolted or welded to deck with I G acceleration capability. Mason Type SSLFH or acceptable equal.

C. Type II (snubber): Each corner of side shall incorporate a seismic restraint having a minimum 5/8" thick resilient pad limit stops working in all directions. Restraints shall be made of plate, structural members, or square metal tubing concentric within a welded assembly incorporating resilient pads. Angle bumpers are not acceptable. System to be field bolted or welded to a deck with 1 G acceleration capability. Mason Type Z-1011 and Z-1225 or acceptable equal.

D. Type III (cable braces): Metal cable type with accepted end fastening devices to equipment and structure. System to be field bolted to deck or overhead structural members using two sided beam clamps to steel or appropriately designed insert for concrete. All parts of system including cables, clamps, excluding fastenings are to be single vendor furnished to assure seismic compliance. Mason Type SCB, SCBH or SCBV or acceptable equal.

E. Type IV (neoprene mount): Double deflection neoprene isolator encased in ductile iron or steel casing minimum .30 static deflection. System to be field bolted or welded to deck with 1 G acceleration capacity. Mason Type BR, RBA or acceptable equal.

F. Type V (seismic anchor): Non-isolated equipment to be field bolted or welded (powder shots not acceptable) to resist seismic forces unless under 100 lb. Shear force required. Mason Type SAS, SAB or acceptable equal.

2.3 VIBRATION ISOLATION - GENERAL

A. Vibration Isolation shall control excessive noise and vibration in the building due to the operation of machinery or equipment, and/or due to interconnected conduit, cable tray and busduct (The installation of all vibration isolation units, and associated hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative.)

B. All vibration isolators shall have either known non-deflected heights or calibration markings so that, after adjustment, when carrying their load, the deflection can be verified.

C. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.

D. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +/- 10%.

E. All neoprene mountings shall have a Shore hardness of 30 to 60 +/- 5, after minimum aging of 20 days or corresponding oven aging.

2.4 VIBRATION ISOLATOR TYPES

A. Type A: Spring isolators:

1. Minimum diameter of 0.8 of the loaded operating height.
2. Corrosion resistance where exposed to corrosive environment with:
   a. Springs cadmium plated or electro-galvanized.
   b. Hardware cadmium plated.
   c. All other metal parts hot-dip galvanized.
3. Reserve deflection (from loaded to solid height) of 50% of rated deflection.
4. Minimum ¼" thick neoprene acoustical base pad on underside, unless designated otherwise.
5. Designed and installed so that ends of springs remain parallel and all springs installed with adjustment bolts.
6. Non-resonant with equipment forcing frequencies or support structure natural frequencies.
7. When used in conjunction with seismic bracing, seismic restraint Type II shall be installed.
8. Mason Type SLF, or acceptable equal.

B. Type B: Spring isolators shall be same as Type A, except:

1. Provide built-in vertical limit stops with minimum ¼" clearance under normal operation.
2. Tapped holes in top plate for bolting to equipment when subject to wind load.
3. Capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be identical
4. Adjustable and removable spring pack with separate neoprene pad isolation.
5. Capable of accepting 1 G of acceleration.
6. Mason Type SLR, or acceptable equal.

C. Type C: Spring hanger rod isolators:

1. Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
2. Steel retainer box encasing the spring and neoprene cut.
3. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
4. Mason Type HS, or acceptable equal.

D. Type D: Neoprene mount:

1. Double deflection neoprene isolator encased in ductile iron or steel casing minimum .30 static deflection. System to be field bolted or welded to deck with 1 G acceleration capacity
2. Mason Type BR, RBA, or acceptable equal.

E. Type E: Elastomer hanger rod isolators:

1. Molded unit type neoprene element with projecting bushing lining rod clearance hole.
2. Neoprene element to be minimum 1-3/4" thick.
3. Steel retainer box encasing neoprene mounting.
4. Clearance between mounting hanger rod and neoprene bushing shall be minimum of 1/8".
5. Minimum static deflection of 0.35".
6. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
7. Mason Type HD, or acceptable equal.

F. Type F: Combination spring/elastomer hanger rod isolators:

1. Spring and neoprene isolator elements in a steel box retainer. Neoprene double deflection type. Single deflection is unacceptable. Spring seated in a neoprene cup with extended rod bushing.
2. Characteristics of spring and neoprene as described in Type A and Type E isolators.
3. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
4. Mason Type DNHS, or acceptable equal.

G. Type G: Pad type elastomer mountings:

1. ¾" Minimum thickness.
2. 50 PSI maximum loading.
3. Waffled design.
4. Deflection per pad thickness.
5. Galvanized steel plate between multiple layers or pad thickness.
6. Suitable bearing plate to distribute load.
7. Mason Type Super W, or acceptable equal.

H. Type H: Grommet type elastomer bushings:

1. One piece molded bridge bearing neoprene.
2. Washer / bushing shall surround the anchor bolt.
3. Flat washer face to avoid metal to metal contact.
4. Mason type HG, or acceptable equal.

I. Type I: Housekeeping pad anchors:

1. Housekeeping pad anchors shall consist of a ductile iron casting that is tapered and hexagonal, smaller at its base than at its top. The upper portion shall have holes for rebar to pass thru. The anchor shall be continuously threaded from top to bottom for the attachment of soleplates. Housekeeping pad anchors shall be attached to the structural slab using a stud wedge anchor
2. Mason type HPA and SAS, or acceptable equals.

J. Type J: Panelboard mounts:

1. Assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves shall bolt sheet metal panels to the walls or supporting structure. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality.
2. Mason type PB, or acceptable equal.

PART 3 EXECUTION

3.1 GENERAL SEISMIC RESTRAINT REQUIREMENTS

A. Install seismic restraints in accordance with manufacturer's recommendations.

B. Seismic restraining system Type III: Install taut for non-isolated equipment and slack with ½" cable deflection for isolated systems.

C. Seismically restrain all conduit, cable tray and busduct with Type III and/or Type V seismic restraint in accordance with guidelines outlined below. Restraints which are to be used in conjunction with vibration isolators shall be Type III. Conduit, cable tray and busduct shall be braced at maximum 30' intervals or at both ends if the electrical run is less than the specified interval, and at every turn. Lateral bracing at maximum 60'.

D. All rigid floor mounted equipment must have a resilient media (type H) between the equipment mounting hole and the anchor bolt (type V).

E. Equipment mounted on housekeeping pads: Pads shall be properly doweled or expansion shielded to deck to meet acceleration criteria. Type I.

F. Seismic Restraints are not required for the following:

1. All conduit less than 2 1/2" diameter suspended by individual hanger rods.
2. All conduit suspended by individual hanger 12" or less in length from the top of the conduit to the bottom of the support for the hanger. However if the 12" limit is exceeded by any hanger in the run, seismic bracing is required for the run
3. The 12" exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

G. For overhead supported equipment, over stress of the building structure must not occur. Bracing can occur from:

1. Flanges to structural beams.
2. Upper or lower truss chords in bar joist construction at panel points.
3. Cast-in-place inserts or drilled and shielded inserts in concrete structures.

3.2 GENERAL VIBRATION ISOLATION REQUIREMENTS

A. Install isolators in accordance with manufacturer's recommendations. Vibration isolators shall not cause any change of position resulting in stresses or misalignment.

B. Electrical equipment shall be isolated from the building structure by means of noise and vibration isolators.

C. Provide resiliently mounted equipment with seismic snubbers. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch (1.5 mm) maximum clearance. Other snubbers shall have clearance between 0.15 inch (4 mm) and 0.25 inch (7mm).

3.3 LIGHTING FIXTURES

A. Provide a lateral bracing system.

B. Fixture supports will employ materials which are suitable for the purpose.

C. Loop and hook or swivel hanger assemblies for pendant fixtures shall be filled with a restraining device to hold the stem in the support position during earthquake movements.

D. Pendant supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

E. Each recessed fluorescent individual or continuous row of fixtures shall be supported by a seismic restraint suspended ceiling support system., and shall be fastened thereto at each corner of the fixture; or shall be provided with a fixture support wire attached to the building structural members using two wires for individual fixtures and one wire per unit of continuous row fixtures. These support wires (min No. 12 ga. wire) shall be capable of supporting four times the supported load.

F. Each surface mounted fluorescent individual or continuous row of fixtures shall be supported by a seismic restraint suspended ceiling support system. Fixture support devices shall be locking type scissor clamp, or a full loop band which will securely attach to the ceiling support.

G. Fixtures attached to the underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.

H. Each wall mounted emergency light unit shall be secured in a manned to hold the unit in place during a seismic disturbance.

I. Suspension systems for lighting fixtures that are free to swing a minimum of 45° from the vertical in all directions are acceptable if a passing shaking table test accepted by the using agency is conducted and will withstand without failure a force of not less than four times its own weight.

3.4 INSPECTION

A. Upon completion of the installation of all vibration isolation and seismic restraints, the manufacturer's local representative shall visit the project jobsite, visibly inspect all installations and report, in writing, any and all deficiencies from the specifications. Any additional corrective measures required to put the system in total compliance shall be the responsibility of the installing contractor.

Vibration Isolation and Seismic Restraint Schedule				
Equipment	Base	Isolator	Seismic Restraint	Deflection

END OF SECTION 260195

SECTION 260375

UNDERGROUND CONDUIT SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Earthwork: Section 02300.
Cast-In-Place Concrete: Section 03300.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rigid Ferrous Metal Conduit: Steel, galvanized on the outside and inside (conduit enameled on the inside will not be accepted), UL categorized as Rigid Ferrous Metal Conduit (identified on UL Listing Mark as Rigid Metal Conduit-Steel or Rigid Steel Conduit), as manufactured by Allied Tube & Conduit Corp., Midwest Electric, Occidental Coating Co., Robroy Industries Inc., Steelduct Conduit Products, Triangle PWC Inc., or Wheatland Tube Co.

B. Rigid Nonmetallic Conduit And Fittings (Concrete Encased): Carlon Electrical Sciences Inc.'s Sch. 40, Certain Teed Corp.'s Sch. 40, National Pipe Co.'s Sch. 40, or Queen City Plastic Inc.'s Sch. 40.

C. Conduit Spacers and Levelers: Commercially manufactured type to suit conduit, installation and spacing requirements.

D. Duct Seal: Appleton Electric Co.'s DUC Weatherproof Compound, Manville Corp.'s Duxseal, or OZ/Gedney Co.'s DUX.

E. Drag Line: Minimum 1/8 inch polypropylene monofilament utility rope; American Synthetic Ropes' Flotorope, Greenlee Tool Co.'s 2 ply Rope 43l, or Thomas Industries/Jet Line Products' Rope 232.

F. Thru Wall Sealing Bushings:

1. For Walls Which Have or Will Have Membrane Waterproofing:
   a. Cast-In-Place Installations: OZ/Gedney Co.'s Type FSK thruwall seal and Type FSKA membrane clamp adapter.
   b. Core Drilled or Sleeved Installations: OZ/Gedney Co.'s Type CSM and Type CSMC with membrane clamp adapter.
2. For Walls Which Will Not Have Membrane Waterproofing:
   a. Cast-In-Place Installations: OZ/Gedney Co.'s Type FSK.
   b. Core Drilled or Sleeved Installations: OZ/Gedney Co.'s Type CSM, or Thunderline Corp.'s Link-Seal.

G. End Bells:

1. For Rigid Ferrous Metal Conduit: OZ/Gedney Co.'s Type TNS.
2. For Rigid Nonmetallic Conduit: Conduit manufacturer's standard end bells.

H. Insulated Grounding Bushings: Appleton Electric Co.'s GIB-50 Series, Efcor Inc.'s 56-50-4 Series, Midwest Electric Mfg. Corp.'s GLL Series, OZ/Gedney Co.'s IBC-50L Series, Raco Inc.'s 1212 Series, or Thomas & Betts Corp.'s 3870 Series.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installing any Work, lay out the proposed course for the conduits, location of manholes, etc. and have same accepted by the Owner.

3.2 INSTALLATION

A. Spacing:

1. Conduit Bank: Separate individual conduits a minimum of 3 inches unless greater spacing is indicated. Use spacers and levelers located no more than 4 feet apart.

B. Depth:

1. Unless otherwise indicated or directed, install conduit 36 inches below existing finished grade to conduit centerline, unless otherwise indicated.
2. Under Roads and Parking Lots:
   a. Rigid Ferrous Metal Conduit: Unless otherwise indicated or directed, install rigid ferrous metal conduit more than 36 inches below top surface of roads and parking lots.
   b. Rigid Nonmetallic Conduit (Concrete Encased): Unless otherwise indicated or directed, install concrete encased rigid nonmetallic conduit more than 30 inches below finished grade.
3. Crossing Obstructions: Use rigid ferrous metal conduit where top of conduit system is less than 36 inches below finished grade when crossing obstructions (heating tunnels, etc.).

C. Pitch:

1. Pitch conduit away from buildings.
2. Pitch conduit toward manhole a minimum of 12 inches per 100 feet. On runs where it is impossible to maintain the grade all one way, grade from center so that conduits pitch both directions down toward manholes.

D. Concrete Encasement:

1. Lay rigid nonmetallic conduits on a continuous concrete footing not less than 3 inches thick and as wide as the encasement. Install footings straight and true both in line of run and transversely, and finished with an even surface. Incorporate anchoring devices into the footing for use in tying down the conduits. Grade footings so that conduits maintain required pitch. Before installing spacers, levelers, and conduits, let concrete footings harden as required to prevent damage to the footings.
   a. Where conduits enter building or manhole wall, reinforce footings for 10 feet with No. 4 rods, 4 inches on center.
2. After rigid nonmetallic conduits have been laid on footing with spacers and levelers (located no more than 8 feet apart), tie conduits down to the footing, then surround the conduits by concrete not less than 2 inches thick on top and 2 inches on each side. Separate individual conduits a minimum of 3 inches, or as indicated, so that each conduit is completely enveloped in concrete.
   a. Where conduits enter building or manhole walls, reinforce encasement for 10 feet with No. 4 rods, 4 inches on center.
3. Form sides of the concrete encasement. Exception: Earth cuts will be permitted as the form where trenches are neatly excavated in stable soils.

E. Jacking Conduits: Rigid ferrous metal conduit may be jacked under roads, parking lots, etc. Submit jacking details for approval.

F. Conduits in Filled Ground: Where indicated reinforce the footing and encasement for rigid nonmetallic conduits 10 feet beyond limits of fill. Reinforcement, footing or encasement is not required for rigid ferrous metal conduit.

G. Conduits Entering Buildings and Manholes:

1. Seal conduit entrances into manholes watertight.
2. Seal conduit entrances into building walls watertight. Exception: Seal is not required in below grade foundation walls associated with slab on grade construction.
3. Install end bells at conduit entrances into manholes.
4. Install end bells at conduit entrances into buildings. Exceptions:
   a. Install insulated grounding bushing on conduit entrance stub up associated with slab on grade construction.
   b. Install insulated grounding bushing and 2 locknuts on conduit where conduit is terminated in cabinet, junction or pull box.

H. Cleaning Conduits: Take precautions to prevent foreign matter from entering conduits during installation. After installation clean conduits with tools designed for the purpose.

I. Conduit for Future Use (Spare Conduit and Empty Conduit): Demonstrate to the Owner's Representative that conduits installed for future use are clear of obstructions (draw mandrel 1/2 inch less in diameter than conduit). Install a drag line in each conduit.

J. Sealing Ends of Conduits:

1. Occupied Conduits: Seal ends of conduits to be used for Work of this contract until cables are to be installed. After cable installation, seal conduits at building entrances and first manhole outside building. Seal with duct seal.

2. Conduits For Future Use: Seal the ends of spare and empty conduits at building entrances and manholes. Seal with plastic plugs or a contrasting color cement/sand mixture.

3.3 CONDUIT SCHEDULE - TYPES AND USE

A. Rigid Ferrous Metal Conduit: Install in all locations indicated below:
1. Where conduit stubs up or rises through slab or finished grade.
2. Where other type raceways are specified or indicated on the drawings.

B. Rigid Nonmetallic Conduit (Concrete Encased): Shall be installed in all locations except:

1. Where conduit stubs up or rises through slab or finished grade.
2. Where other type raceways are specified or indicated on the drawings.

END OF SECTION 260375

SECTION 260422

SERVICE ENTRANCE (CENTRAL HUNDSON GAS & ELECTRIC)

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of the Primary Metered Electrical Service Entrance as shown on the drawings, as specified in Central Hudson Gas and Electric's "Specifications and Requirements for Electrical Installations" dated January 2024, and/or specified herein.

B. Arrangements with Utility Company for permanent primary electric service including payment of Utility Company charges for service.

C. Overhead and underground service entrance from existing utility company primary pole where pad mounted transformer to building service disconnect switch.

1.3 SYSTEM DESCRIPTION

A. System voltage: 13200/7200Y volts, 3 phase, 4 wire, 60 Hertz.

1.4 QUALITY ASSURANCE

A. Utility Company: Central Hudson Gas & Electric Corp.

Representative: Mr. Corey Chambers
Telephone: 845-563-4529

B. Install service entrance in accordance with Utility Company's rules and regulations.

1.5 EXISTING CONDITIONS

A. Field verify all existing conditions, and report any discrepancies.

1.6 APPROVALS

A. Obtain written, signed and dated utility company approval for the following:

1. Primary Customer pole, 15kV cable feeder, conduit installation, prior to installation of cable.
2. Transformer pad, curb, and grounding installation.
3. Main switchboard shop drawings.

PART 2 PRODUCTS

2.1 TRANSFORMER PAD

A. As detailed on the contract drawings and complying with all requirements of the Specifications and Requirements for Electrical Installations" dated January 2024..

2.2 SERVICE CONDUITS

A. Complying with Specification Section 260375 - "Underground Conduit".

B. Underground Primary Lines: Concrete encased schedule 40, rigid non-metallic conduit. with rigid galvanized steel conduit pole riser. (Conduit size as indicated)

C. Secondary Lines: Concrete encased schedule 40, rigid non-metallic conduit. . (Conduit size as indicated).

2.3 SERVICE CONDUCTORS

A. Primary Lines to Primary metering pole: By utility company. Primary lines from Primary metering pole to pad mounted transformer to be provided by Electrical Contractor.

B. Secondary Lines: Complying with Specification Section 260120 - " WIRING, GENERAL - 600 VOLTS AND UNDER "..

PART 3 EXECUTION

3.1 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the project.

B. Comply with the latest edition of C.H.G. & E. Corp's specification & requirements for Electric installations and as follows:

1. General Service Information:
   a. CHG&E owned and provided overhead primary cables.
   b. Electrical contractor shall provide underground primary cable system from primary metering pole to pad mounted transformer(s).
2. The Electrical Contractor shall provide the following:
   a. Transformer(s) pad/vault as detailed on contract drawings and per CHG&E Blue Book.
   b. All conduits and concrete encasements as indicated on contract drawings.
3. The Electrical Contractor shall provide underground secondary conduit, cables and concrete encasement from pad mounted transformer(s) to main switchgear as indicated on contract drawings.

   CAUTION! A minimum of ten foot (10') clearance shall be maintained at all times from C.H.G. & E.'s energized conductors to persons, tools, and material (including the cable being installed.

4. The materials to be used and their installation shall be in accordance with C.H.G. & E.'s Blue Book Specifications.
5. The ends of all customer installed cable shall be sealed, by the customer, to protect the cable from dirt and moisture contamination.
6. C.H.G. & E. reserves the right to inspect the primary cable installation prior to backfilling and to require the customer to have the cable DC proof tested by an independent testing firm when:
   - the cable has not been pre-accepted by C.H.G. & E., or
   - the cable has been spliced, or
   - the cable appears to have been damaged, or
   - the ends are not adequately sealed to prevent moisture from entering the cable.
7. CHG&E shall provide service and metering equipment in accordance with C.H.G. & E. specifications. For three phase installations, bushing mounted metering transformers may be required by C.H.G. & E. For these installations, the Electrical contractor shall provide a separate 1 ½" metering conduit and a pedestal for the meter installation complying with CHG&E Blue Book requirements..

C. C.H.G. & E.'s Responsibility

1. Provide primary cabling in electrical contractor provided duct bank from riser pole(s) to pad mounted transformer(s) locations.
2. Furnish and install lightning arresters and fused cutouts at C.H.G. & E.'s pole.
3. Furnish and install the primary cable terminations (connectors) at the padmount transformer and at a C.H.G. & E. riser pole, providing that the customer's cable has been reviewed and accepted by C.H.G. & E. prior to ordering.
4. Make the final connections from C.H.G. & E.'s overhead line to the customer's facilities.

END OF SECTION 260422

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260425

SWITCHBOARDS

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of switchboards as shown on the drawings, and/or specified herein.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

E. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types for types other than NEMA 250, Type 1.

3. Detail bus configuration, current, and voltage ratings.

4. Detail short-circuit current rating of switchboards and overcurrent protective devices.

5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.

6. Detail utility company's metering provisions with indication of approval by utility company.

7. Include evidence of NRTL listing for series rating of installed devices.

8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

10. Include diagram and details of proposed mimic bus.

11. Include schematic and wiring diagrams for power, signal, and control wiring.

F. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

G. Delegated Design Submittal:

1. For arc-flash hazard analysis.

2. For arc-flash labels.

H. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

I. Qualification Data: For [Installer] [testing agency].

J. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, 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.

K. 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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Routine maintenance requirements for switchboards and all installed components.

b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 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. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.

2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

3. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

1.6 QUALITY ASSURANCE

A. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction, and that portion of the NEC which pertains to installation and construction of switchboards.

B. UL Compliance: Comply with applicable requirement of UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", UL 489 "Molded-Case Circuit Breakers and Circuit Breaker Enclosures", and UL 891, "Dead Front Electrical Switchboards", pertaining to installation and construction of switchboards. Provide switchboards and components which are UL-listed and labeled.

C. IEEE Compliance: Comply with applicable requirements of IEEE std 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to switchboards.

D. ANSI Compliance: Comply with applicable requirements of ANSI standards pertaining to switchboard assemblies.

E. NEMA Compliance: Comply with applicable portions of NEMA stds Pub/No. PB 2, "Dead-front Distribution Switchboards", PB 2.1, "General Instruction for Proper Handling, Installation, Operation and Maintenance of Dead Front Distribution Switchboards Rated 600 Volts or Less," and SG 3, "Low-Voltage Power Circuit Breakers", pertaining to switchboard assemblies.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

1. Eaton
2. General Electric Co.
3. Siemens Energy & Automation, Inc.
4. Schenider Electric (Square D)

2.2 MATERIALS

A. General: Except as otherwise indicated, provide switchboards and ancillary components of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for complete installation.

B. AC Dead-Front Distribution Switchboards: Provide factory-assembled, dead-front, metal-enclosed, self-supporting secondary power switchboards, of types, sizes, electrical ratings and characteristics indicated; consisting of vertical panel units, and containing circuit-breakers and usable switch assemblies of quantities, ratings and types indicated. Provide copper main bus and connections to switching devices and circuit breaker branches of sufficient capacity to limit rated continuous current operating temperature rise to of no greater than 65 deg. C above average ambient temperature of 30 deg. C; with main bus and tap connections silver-surfaced and bolted tightly according to manufacturer's torquing requirements for maximum conductivity. Brace bus for short-circuit stresses up to 75,000 ampere interrupting capacity. Provide mimic bus on front of each switchboard; prime and coat switchboard with manufacturer's standard finish and color. Equip units with built-in lifting eyes and yokes; and provide vertical individual panel units, suitable for bolting together at project site. Construct switchboard unit for the following environment: Indoors, NEMA Type 1.

C. Enclosures: Construct dead-front switchboards, suitable for wall or floor mounting, with front cable/wiring accessibility.. Provide welded steel channel framework; hinge wireway front covers to permit ready access to branch circuit-breaker load side terminals. Coat enclosures with manufacturer's standard corrosive-resistant finish.

D. Circuit Breakers: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

1. Molded-Case Circuit Breakers: Provide factory-assembled, molded-case circuit breakers of frame sized indicated; rated amperes as indicated on drawings, 208volts, 60 Hz, 3-poles with 65kA RMS symmetrical interrupting ratings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Provide push-to-trip button on enclosure cover for mechanically tripping circuit breakers. Construct breakers for mounting and operating in a horizontal position and operating in an ambient temperature of 40 deg. C Provide breakers with mechanical screw type removable connector lugs, AL\CU rated, and with NEMA Type 1 general purpose enclosures.

E. Busing: Provide switchboard busing with sufficient cross-sectional area to fulfill UL 891 pertaining to temperature rise. Construct through-bus of silver plated copper with ampacity rating of 800A and above, and with short-circuit current rating of 65 kA RMS symmetrical.

F. Ground Fault Protection: Furnish and install in the switchboard ground fault protection and indication equipment as specified herein as shown on the drawings in accordance with NEC # 230-95. All parts of the system shall be UL listed and have a fault current withstand rating of 200,000 amperes, symmetrical, for one (1) second. All ground fault protection and indication equipment shall be factory installed, wired an tested by the switchboard manufacturer. The ground fault relay shall be a line-powered, self-contained device and shall be designed to mount in the front panel of the switchboard. The ground fault relay shall be supplied with 120 VAC control power from a suitably rated control transformer whose primary is connected phase-to-phase.

G. Metering: Provide mounting space within main and distribution compartments for metering Ct's, PT's and instrument displays. Mount meters recessed in front doors and install meter wiring and lacing with sufficient flexibility at hinged edge of meter front mounting plates to prevent damage. See Division 26, Section 260916, "Power Monitoring and Control".

H. Fuses: Provide fuses complying with Division 26, Section 260475, "Fuses", in accordance with the following listed electrical characteristics: Class L time-delay.

I. Surge Arrestor: Provide separate lugs on main buss bars for connecting 1 (#6-250kcmil) conductor per phase and neutral for tap connection to surge arrestor. See Division 26, Section 260450, "Surge Arrestors".

J. Factory Test: The switchboard shall be factory assembled, inspected and tested before delivery, and shall be designed and built in accordance with the latest editions of Underwriters Laboratories No. UL-891 and NEMA PB-2. The manufacturer shall subject the completely-assembled switchboard to a high-potential test in conformance with the NEMA Standard for Power Switchboard Assemblies.

2.3 WARNING SIGNS

A. All protective covers and screens providing access to potential live voltage shall also be provided with painted embossed aluminum "WARNING - Arc Flash and Shock Hazard - Appropriate PPE Required" signs which comply with ANSI Z535.4-1998. These signs shall also include the specific parameters of the hazard and the PPE level for the working personnel. The sign shall be similar to the following, with all spaces completed for each specific piece of equipment:

WARNING
Arc Flash and Shock Hazard
Appropriate PPE Required

"__" inch	Flash Hazard Boundary
"__"	cal/cm2 Flash Hazard at "__" inches
"__"	PPE Level, _____
	_____
"____VAC"	Shock Hazard when cover is removed
"__" inch	Limited Approach
"__" inch	Restricted Approach - _____
"__" inch	Prohibited Approach - _____

Equipment Name: "_____"

PART 3 EXECUTION

3.1 INSTALLATION

A. Install switchboard as indicated, in accordance with manufacturer's written instructions, and with recognized industry practices; complying with applicable requirements of NEC, NEMA's Stds Pub/No. PB 2.1, and NECA's "Standard of Installation".

B. Set switchboard on 4" high concrete pad and anchor to building structure as recommended by the manufacturer. Protect switchboard during construction with covering to keep all sections clean and dry at all times. Provide heat necessary to eliminate condensation.

C. Coordinate raceway entries into switchboard so that sections having spare devices or spaces for future devices have adequate accessible space in raceway entry areas for future raceway. Ground all raceways entering switchboard to the main ground bus using ground bushings and bonding jumpers.

3.2 ADJUST AND CLEAN

A. Adjust ground fault settings and, before energization, torque all bus joints to insure tightness, check for any foreign material and inspect all cable lugs for spacing and tightness.

3.3 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring in accordance with Section 260120, "Wires & Cables".

B. All metallic raceways entering the switchboard shall be provided with ground bushings which shall be bonded to the ground bus.

C. All wire and cable within the switchboard shall be served up, racked and tied in a neat workmanlike manner.

3.4 INSTALLATION OF BASIC IDENTIFICATION

A. Switchboard and each individual switch shall be identified on the front cover with its name, available voltage, were fed from and service feeder size. Identification shall be in the form of laminated plastic nameplates, black face with the letters engraved into the white background, minimum 1/4" high. Plates shall be drilled on each end for sheet metal screw attachment. No "DYMO" or similar tape type labels will be allowed.

The following is an example of the nameplate layout:

MAIN SWITCHBOARD
120/208 VOLT, 3 PHASE, 4-WIRE
FED FROM MDS
(4#4/0, 1#4G, in 2.5"C)

B. In addition to individual switches, nameplates shall be installed at front and rear of each section door, meters, current transformers, test blocks, relays, fuse blocks and associated controls.

3.5 INSTALLATION OF WARNING SIGNS

A. The contractor shall hire the panelboard manufacturer to perform a short-circuit and arc-flash hazard study to obtain the data required to properly size the panelboards and install the proper warning signs with the proper completed data.

3.6 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all accessible connections to manufacturer's torque tightening specifications.

B. Prior to energization of switchboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check switchboards for electrical continuity of circuits, and for short-circuits.

END OF SECTION 260425

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260426

DOUBLE ENDED SERVICE ENTRANCE SWITCHBOARDS

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of switchboards as shown on the drawings, and/or specified herein.

1.3 QUALITY ASSURANCE

A. Electrical Code Compliance; Comply with applicable local code requirements of the authority having jurisdiction, and that portion of the NEC which pertains to installation and construction of switchboards.

B. UL Compliance: Comply with applicable requirement of UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", UL 489 "Molded-Case Circuit Breakers and Circuit Breaker Enclosures", and UL 869, "Electrical Service Equipment", pertaining to installation and construction of switchboards. Provide switchboards and components which are UL-listed and labeled for service entrance use.

C. IEEE Compliance: Comply with applicable requirements of IEEE Standard 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to switchboards.

D. ANSI Compliance: Comply with applicable requirements of ANSI standards pertaining to switchboard assemblies.

E. NEMA Compliance: Comply with applicable portions of NEMA stds Pub/No. PB 2, PB 2.1, and SG 3, "Low-Voltage Power Circuit Breakers", pertaining to switchboard assemblies.

F. Comply with all requirements of Central Hudson Gas and Electric.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

E. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types for types other than NEMA 250, Type 1.

3. Detail bus configuration, current, and voltage ratings.

4. Detail short-circuit current rating of switchboards and overcurrent protective devices.

5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.

6. Detail utility company's metering provisions with indication of approval by utility company.

7. Include evidence of NRTL listing for series rating of installed devices.

8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

10. Include diagram and details of proposed mimic bus.

11. Include schematic and wiring diagrams for power, signal, and control wiring.

F. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

G. Delegated Design Submittal:

1. For arc-flash hazard analysis.

2. For arc-flash labels.

H. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

I. Qualification Data: For Installer and testing agency.

J. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, 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.

K. 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.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Routine maintenance requirements for switchboards and all installed components.

b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 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. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.

2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

3. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

1. Eaton
2. General Electric Co.
3. Siemens Energy & Automation, Inc.
4. Schenider Electric (Square D)

2.2 MATERIALS

A. General: Except as otherwise indicated, provide switchboards and ancillary components of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for complete installation.

B. Double Ended Service Entrance Sections:

1. General: Switchboard to be free standing, NEMA Class II, front accessible, 208 volt, three phase, four wire, service entrance rated, 90" high, maximum 38"deep deep, with section widths as required. Branch devices front connectable, bus connections front accessible only.
2. Bussing: Incoming line sections shall be rated at 2000 ampere with 100% neutral and shall be bussed for bottom feed. The width is to match section width. All bus in the switchboard shall be sized for maximum current density, 1000 ampere per square inch. This bus shall be silver or tin plated copper. All bus shall be supported to withstand the thermal and magnetic effects of 100,000 symmetrical RMS amperes without serious movement or displacement. Bus bars shall be stamped or stenciled to indicate proper phase (A. B. C. N). The insulators shall be fastened to the frame of the switchgear. Provide a 1/4" x 4" copper ground bus full length of switch gear and two (2) 1/4" x 4" neutral to ground strap.
3. Terminals: All terminations shall be marked "75^{o} ONLY", "60/75^{o}" or listed for use of 75^{o}C insulated conductors at full 75^{o} C ampacity.
4. Insulated Case Circuit Breakers (Mains and Tie):
   a. There shall be two (2) identical main breaker sections. Each section shall include a programmable "LSGI" circuit breaker, with a breaker status control module with motor mechanism that is programmable. The main circuit breakers shall be 2000 amp frame with 2000 ampere trip. Breakers shall be equipped with ark flash reduction, similar to Siemens Dynamic Ark Flash Sentry,
   b. There shall be a tie circuit breaker section with a programmable circuit breaker instrument transformer, and differential ground fault system relays, a breaker status control module with motor mechanism that is programmable. The tie circuit breaker shall be 2000 amp frame with 2000ampere trip. Breaker shall be equipped with ark flash reduction, similar to Siemens Dynamic Ark Flash Sentry,

c. The power circuit breakers shall be insulated case, rated at 600 volts, A.C., 3 pole, 3 phase, 60 HZ. Solid state trip units shall be provided for adjustable overcurrent trip. The breakers shall be quick-make, quick break with stored energy mechanism. The breakers shall be manually opened or closed, and electrically opened by shunt-trip from pushbutton or ground fault.

d. The two (2) main circuit breakers shall be so interlocked with the tie breaker, that only one (1) can be closed at any time when the tie breaker is closed. The tie breaker shall open (trip) if both main circuit breakers close. Open-closed indicating lights shall be on the doors for each of three circuit breaker cubicles.

1. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, similar to the Siemens WL breakers ETU776 trip unit. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a Siguard motion sensor set to the arc flash boundary. Breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2017 240.87.

B. Ground Fault: Provide ground fault protection system utilizing the above noted C/T's and differential current relays to trip each of the respective breakers. Manufacturer and engineer to select settings to coordinate protective devices.

C. Phase Monitoring: Provide monitors on all three phases of the secondary service. If any phase is lost or if any phase drops below 85% @ 2% of rated voltage, system is to provide a dry contact alarm point for pick-up by building security system.

D. Owner Digital Metering: Provide mounting space within main and distribution compartments for metering CT's, PT's and instrument displays. Mount meters recessed in front doors and install meter wiring and lacing with sufficient flexibility at hinged edge of meter front mounting plates to prevent damage.

1. Meter shall measure voltage and current, watts (total and per phase), VARs (total and per phase), VA (total and per phase), power factor (total and per phase), voltage max/min in the interval, and frequency.

2. Meter shall accumulate readings for watt-hour, VA-hour, and VAR-hour. All readings shall be accumulated and stored for each of the 4 quadrants of power.

3. Power demand shall be simultaneously calculated using four different averaging methods: Fixed Window (Block) Average, Sliding Window (Rolling Block) Average, Thermal Average, and Cumulative window demand.

4. Meter shall provide high-speed readings updated every cycle, a programmable 2-20 cycles, and one second, simultaneously.

5. Meter shall calculate readings that are CT and PT compensated and transformer/line loss compensated. Both compensated and uncompensated readings shall be available simultaneously.
6. Meter shall offer perpetual time of use with configurable rates/seasons and cumulative/continuous cumulative demand.
7. Meter shall automatically perform self-calibration to an internal reference every ten seconds, for the meter's life. Meter must stabilize its readings within ten seconds of powering up.
8. ANSI C12.20 0.1 CL and IEC 62053-22 0.2S class accuracy.
9. 0.06% energy accuracy.
10. Voltage accuracy within less than 0.05% for one second reading and less than 0.1% for high-speed readings.
11. Current accuracy within less than 0.025% for one second reading and less than 0.1% for high-speed readings.
12. Meter shall provide a one cycle high-speed frequency reading with a frequency resolution of better than 10 mHz..
13. Meter's internal precision real time clock shall provide max accuracy of 3.5 ppm at full temperature range, with less than 10 seconds per month drift.
14. Meter shall provide accuracy test mode via software and the two front KYZ pulses. Test mode shall support positive/negative Wh, positive/negative VARh, per quadrants; test with or without TLC and PT/CT Compensation.
15. Meter shall support ability to pre-set accumulators to be used when swapping out a meter for accuracy testing and validation.
16. Meter shall measure power quality and be 3rd party certified in accordance with the IEC 61000-4-30 Class A Edition 3 standard.
17. Meter shall allow viewing of voltage and current harmonic magnitudes in real time to the 127th order. Meter's harmonic measurement shall be in accordance with the IEC 61000-4-7 standard.
18. Meter shall have 16-bit waveform and fault recorder, recording up to 1024 samples/cycle continuously on all 8 channels simultaneousl.
19. Meter shall capture transients on 4 voltage input channels with at least 800,000 samples/cycle or 50 MHz sampling speed.
20. Meter shall support EN 50160 reporting with user customizable setpoints to meet jurisdictional requirements.

E. Surge Arrestor: Provide separate lugs on main buss bars for connecting 1 # (6-250kcmil) conductor per phase and neutral for tap connection to surge arrestor. See Division 26, Section 260450, "Transient Voltage Surge Suppressors".

2.3 SWITCHBOARD DISTRIBUTION SECTIONS

A. General: Switchboard to be free standing, NEMA Class II, front accessible, 208 volt, three phase, four wire, 90" high, with section widths as required. Branch devices front connectable,

B. Bussing: Incoming line sections shall be rated at 2000 ampere with 100% neutral and shall be bussed for bottom feed consisting of 8-750 MCM per phase and neutral 750 MCM for ground. All bus in the switchboard shall be sized for maximum current density, 1000 ampere per square inch. This bus shall be silver or tin plated copper. All bus shall be supported to withstand the thermal and magnetic effects of 100,000 symmetrical RMS amperes without serious movement or displacement bus bars shall be stamped or stenciled to indicate proper phase (A, B, C, N). The insulators shall be fastened to the frame of the switchboard. Provide a 1/4" x 4" copper ground bus full length of switchboard. Distribution sections of the switchboard shall be fusible type with full height bussing and 60" mounting space. Make provision in bussing for a future section.

C. Terminals: All terminations shall be marked "75° ONLY", "60/75°" or listed for use of 75°C insulated conductors at full 75° C ampacity.

1. Circuit Breakers: Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:
2. Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.
3. Provide motor operated branch breakers as indicated, each breaker shall include a programmable "LSGI" circuit breaker, with a breaker status control module with motor mechanism that is programmable.
4. Functions: Long time, short time and extended instantaneous protection function (EIP) shall be provided to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I2t ramp.
5. A software program shall be made available free of charge to support system coordination studies. The software will allow time current curves to be generated for the chosen settings.
6. Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition.
7. Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system ModBus.
8. Current Adjustability shall be accomplished by use of dial settings and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.
9. Pickup Points: 10 Long Time Settings.
10. Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I2t ramp. Arrange to provide protection for four-wire service.
11. A LCD display shall be available to simplify settings & viewing data locally.
12. The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.

13. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.
14. Waveform capture and display shall be accomplished on the trip units LCD display. ETU776 only.
15. Terminal Block Connections, shall be front mounted and utilize Screw Type Terminals
16. Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.
17. Accessories shall be front mounted.
18. Field interchangeable accessories shall include CT's, trip units, racking mechanism and all internal & external accessories.

D. Fuses: Provide fuses complying with Division 26, Section 260475, "Fuses", in accordance with the following listed electrical characteristics:

1. Class L current limiting
2. Class RK-1 Time-Delay

E. Factory Test: The switchboard shall be factory assembled, inspected and tested before delivery, and shall be designed and built in accordance with the latest editions of Underwriters Laboratories No. UL-891 and NEMA PB-2. The manufacturer shall subject the completely-assembled switchboard to a high-potential test in conformance with the NEMA Standard for Power Switchboard Assemblies.

F. WARNING SIGNS

1. All protective covers and screens providing access to potential live voltage shall also be provided with painted embossed aluminum "WARNING - Arc Flash and Shock Hazard - Appropriate PPE Required" signs which comply with ANSI Z535.4-1998. These signs shall also include the specific parameters of the hazard and the PPE level for the working personnel. The sign shall be similar to the following, with all spaces completed for each specific piece of equipment:

WARNING
Arc Flash and Shock Hazard
Appropriate PPE Required

"__" inch	Flash Hazard Boundary
"__"	cal/cm2 Flash Hazard at "__" inches
"__"	PPE Level, _____
	_____
"____VAC"	Shock Hazard when cover is removed
"__" inch	Limited Approach
"__" inch	Restricted Approach - _____
"__" inch	Prohibited Approach - _____

Equipment Name: "_____"

PART 3 EXECUTION

3.1 INSTALLATION

A. Install switchboards as indicated, in accordance with manufacturer's written instructions, and with recognized industry practices; complying with applicable requirements of NEC, NEMA's Stds Pub/No. PB 2.1, and NECA's "Standard of Installation".

B. Unit shall be shipped sectional for ease of handling and location in building.

C. Provide control programming of each main breaker, tie breaker and branch 2000amp breaker connected to manual transfer switch. System Sequence of operation shall be as follows:

1. Loss of normal power opens each main breaker, opens 1000amp breaker serving switchboard "MDP2" and closes 2000amp branch breaker being served by generator via manual transfer switch.
2. Photovoltaic (PV) and BESS systems goes off line.
3. BESS unit sync's with generator and return to service. (Generator power charges BESS unit)
4. 1000amp breaker serving switchboard "MDP2" closes.
5. Should generator fail to start or fails during operation, the PV system comes back on line and the BESS unit provides power to switchboard "MDP2". 1000amp breaker in MDS opens to disconnect power from PV and BESS unit from feeding entire building.
6 Upon restoration of utility power, all breakers return back to normal operation positions.

D. Provide minimum of 8 hours of training for operation and maintenance of switchboard to owners designated personal. Schedule training with owners representative minimum 10 working days in advance of scheduled training.

3.2 INSTALLATION OF BASIC IDENTIFICATION

A. Switchboard and each individual switch shall be identified on the front cover with its name and available voltage. Identification shall be in the form of laminated plastic nameplates, black face with the letters engraved into the white background, minimum 1/4" high. Plates shall be drilled on each end for sheet metal screw attachment. No "DYMO" or similar tape type labels will be allowed.

The following is an example of the nameplate layout:

MAIN SWITCHBOARD
480/277 VOLT, 3 PHASE, 4-WIRE

B. In addition to individual switches, nameplates shall be installed at front and rear of each section door, meters, current transformers, test blocks, relays, fuse blocks and associated controls.

3.3 INSTALLATION OF WARNING SIGNS

A. The contractor shall hire the panelboard manufacturer to perform a short-circuit and arc-

flash hazard study to obtain the data required to properly size the panelboards and install the proper warning signs with the proper completed data.

3.4 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring in accordance with Section 260120 "Wires & Cables".

3.5 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all accessible connections to manufacturer's torque tightening specifications.

B. Prior to energization of switchboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check switchboards for electrical continuity of circuits, and for short-circuits.

END OF SECTION 260426

SECTION 260450

SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 Section describes the materials and installation requirements for Surge Protective Devices (SPDs), formerly TVSS, for the protection of AC electrical circuits.

1.2 STANDARDS - Most Recent Editions of:

A. Underwriters Laboratories: UL1449-3rd edition (2009) and all applicable most recent UL standards

B. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002

C. National Electrical Code: Article 285

D. NEMA LS-1(rescinded)

1.3 LISTING REQUIREMENTS:

The SPD industry recently revised UL 1449 Third Edition, 2008 NEC Art 285, and various other surge standards. UL 1449 Third Edition, effective September 2009, includes extensive new independent performance testing. This specification centers on UL 1449 Third Edition certification to ensure comparable test evaluations and accessibility of UL's website to verify spec compliance.

A. All SPD's shall bear the UL Mark and shall be Listed to most recent standard editions of UL 1449. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification. UL always marks listed Surge Protection products with their UL hologram label saying SPD.

B. SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA. Products or parameters without posting at UL.com shall not be approved. (To access UL Category Code VZCA click on Certifications in the left menu bar of UL's home page. Type VZCA into the Category Code search box and click Search.)

Exception: Dedicated end use equipment protection can use UL Recognized SPDs shown on the UL website if the manufacturer installs the product at the original manufacturing site in accordance abiding by the limitations of the UL Recognition. All field applied devices require the UL Listing with the UL holographic label saying SPD.

1.4 SUBMITTAL REQUIREMENTS:

A. Submittals shall include UL 1449 3rd edition listing documentation verifying:

1. Short Circuit Current Rating (SCCR)

2. Voltage Protection Ratings (VPRs) for all modes

3. Maximum Continuous Operating Voltage rating (MCOV)

4. I-nominal rating (I-n)

5. Type 1 Device Listing
   VPR, MCOV, I-n, and Type 1 information is posted at www.UL.com, under Certifications, searching using UL Category Code: VZCA. SCCRs are posted in manufacturer's UL docs.
   UL data and visual inspection takes precedence over manufacturer's published documentation.

B. Submittals shall include shop drawings including manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing all field connections and manufacturer's recommended wire and circuit protection device size.

C. Upon request, an unencapsulated but complete SPD shall be presented for visual inspection; proprietary technology included. MOV type & quantity shall reflect kA ratings on cutsheets, verification of diagnostic monitoring, thermal & overcurrent protection, etc.

D. Any product submittals containing Asbestos or Selenium are to be accompanied by proof of insurance to indemnify and hold harmless the engineer, contractor, and the end use facility owner and operator.

E. Minimum of ten (10) year warranty for service entrance, transfer switch, distribution panelboard, and motor control center applications.

PART 2 PRODUCTS

A. Subject to compliance, the following manufacturers are acceptable:

1. Mersen (formerly Ferraz Shawmut)

2. Optional: Advanced Protection Technologies

3. Optional: Siemens

B. SPD shall be UL labeled with at 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

C. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent devices. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over-temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

D. SPD shall be UL labeled with 20kA $I_{nominal}$ (I_n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

E. Suppression components shall be heavy duty 'large block' 50kA surge-rated MOVs, each exceeding 30mm diameter.

F. Minimum surge current capability (single pulse rated) per phase shall be:

Service Entrance or Transfer Switch: (Choose Option) 100kA or 200kA Distribution panelboard and Motor Control Center: 100kA
Branch panelboards: 100kA
Specific Equipment: 50kA

G. SPD shall provide surge current paths for all modes of protection:

1. L-N, L-G, L-L and N-G for Wye systems

2. L-N, L-G, and L-L for Wye systems when N-G bonding is specified at SPD application point

3. L-L, L-G in Delta and impedance grounded Wye systems.

H. UL 1449 Listed Voltage Protection Ratings (VPRs) for Service Entrance shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
208Y/120	700V	700V	1000V	600V

(Mode VPRs must be verifiable at UL.com. Numerically lower is allowed/preferred; old-style Suppressed Voltage Ratings(SVRs) shall not be submitted, nor evaluated due to outdated testing)

I. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

J. Service Entrance SPD shall have EMI/RFI filtering up to -50dB from 10Khz to 100MHz.

K. Service Entrance SPD shall include visual LED diagnostics including a minimum of one LED indicator per phase, and one red service LED.

L. OPTIONS (select as appropriate per project)

1. SPD shall be provided with 1 set of NO/NC dry contacts for external notification

2. Audible alarm

3. Remote indicator

4. Higher surge rating (in 50kA multiples) for example 200kA, 400kA

5. NEMA enclosure options

Exception: Dedicated end use equipment protection can use UL Recognized SPDs shown on the UL website if the manufacturer installs the product at the original manufacturing site in accordance abiding by the UL Recognition conditions of acceptability. All field applied devices require the UL Listing with the UL holographic label saying SPD.

PART 3 EXECUTION

A. SPDs Externally mounted-

1. At Service Entrance or Transfer Switch, a UL approved disconnect switch shall be provided as a means of servicing disconnect if not connected to at least a 40A breaker.

2. At Distribution, MCC and Branch, SPD shall have an independent means of servicing disconnect such that the protected panel remains energized. A 30A breaker (or larger) may serve this function.

3. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

4. Installer may rearrange breaker locations to ensure short & straightest possible leads to SPDs.

5. SPD shall be installed on the load side of the main service disconnect.

6. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

B. SPDs Internally mounted-

1. Breaker or disconnect shall be provided to de-energize the SPD and its enclosure preventing arc flash hazard exposure during replacement or maintenance without shutting down the switchboard or panelboard.

2. Ground connection to SPD shall be twisted together with line and neutral wire connections to minimize impedance when length of ground wire is in excess of 4 feet.

3. SPD shall be installed on the load side of the main service disconnect.

4. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

END OF SECTION 260450

SECTION 260451

SECONDARY GROUNDING FOR BUILDINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. Motorola R56 "Standards and Guidelines for Communication Sites"

C. NFPA 70.

1.2 DESCRIPTION OF WORK

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of Secondary Grounding for Building as shown on the drawings, and/or specified herein.

B. System Grounding: Ground the electrical SERVICE system neutral at service entrance equipment to metallic water service, building steel, "UFER" ground, and to buried ground loop around building perimeter, and antenna tower grounding loop and grid, plus ground rods bonded together in group. Any splices in grounding conductors shall be made with exothermic weld couplings.

C. Two separate and isolated systems shall be installed as shown on the drawings. The only common points shall be the ground bus located in the main switchboard and at the secondary terminals of transformers creating separately derived systems. These systems are A.C. Neutral Ground System and A.C. Equipment Ground System.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product indicated.

E. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

F. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.

2. Ground rods.

3. Ground rings.

4. Grounding arrangements and connections for separately derived systems.

G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. Plans showing as-built, dimensioned locations of system including the following:

a. Test wells.

b. Ground rods.

c. Ground rings.

d. Grounding arrangements and connections for separately derived systems.

f. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems based on Motorola R56 Specifications,

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

2) Include recommended testing intervals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA

PART 2 PRODUCTS

2.1 GROUND SYSTEM

A. Ground Rods: Use 3/4" x 10' copper weld ground rods, driven 4" below ground surface, separated 12' from one another and from building wall.

B. Conductive Chemical Enhancement: Permanent, EPA approved dry chemical. Erico # GEM-25A.

C. Exothermic Welded Connection: Provide in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

D. Water Meter Jumper: Install bonding jumper at water meter using flat copper braid and O-Z / GEDNEY Type RG grounding connectors.

E. Pipe ground connectors shall be split coupling bolted pressure type for cable to ground connector. Ground connector shall be fastened to pipe with high strength, corrosion-resistant U-bolt. Connection shall be OZ / GEDNEY Type ABG (pipes 1/4" - 1-1/2") or Type CG (pipes 2" - 8").

F. Ground connectors to structural steel building frames shall be corrosion-resistant, high strength copper alloy, double bolted, split plate for #8 - #800 copper cable to steel column web. Coordinate location of drilled hole with structural engineer. Connectors shall be OZ / GEDNEY Type MG.

G. Ground Bar Assemblies: 1/4" x 3" x 18"min. electrolytic copper ground bar mounted on fiberglass insulators rate at 2700 volts which shall be mounted on painted steel brackets. Copper surfaces shall be smooth and without marks deeper than 0.010 inches. There shall be 18, 9/16" diameter holes 2" apart in two horizontal rows 1-3/4" apart. Ground Bars shall be Erico # B543A010.

H. Raised Floor Signal Reference Grids: Shall be in accordance with IEEE Std. 1100-2005. Provide 2" wide by 26 AWG gage (0.0159 inch thick) copper strips on 2 foot centers. All crossovers shall be joined by factory MIG welding. The SRG shall be furnished in rolls from 4' to 16' wide. The sections shall be rolled on tubes with the outside of the roll protected for shipment. Sections shall be field joined using exothermic welding. Provide manufacturer's standard support clips and connectors. Signal Reference Grids shall be Erico Pre-Engineered SRG, OR Harger Flat Strip Bonding Grid.

PART 3 EXECUTION

3.1 A.C. NEUTRAL GROUND SYSTEM

A. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

B. The A.C. system shall be grounded in main distribution switchboard and at the service entrance meter cabinet. Take all special precautions, such as removal of all neutral bonding screws in panelboards, disconnecting switches, etc. System neutral shall be tested before energization (with the disconnect links removed) for any possible ground with a "Megger". Perform this test in the presence of Owner's representative.

3.2 EQUIPMENT GROUNDING SYSTEM

A. All conduits entering metal enclosures shall have double locknuts or, if enclosure does not have provision for connecting by locknuts, provide a ground bushing, wire jumper and solderless lug to bond enclosure. All conduits leaving the main switchboard enclosure shall be grounded to the ground bus by means of a grounding bushing, wire jumper and solderless lug.

B. All metallic conduits 1-1/4" or larger shall have grounding bushings.

C. All distribution and branch circuit panels shall have a separate ground bar, "ILSCO" or acceptable equal.

D. Install a green equipment ground conductor (size per the NEC or as shown on drawings) in conduit with each phase to phase or phase to neutral circuit. Connect conductor to ground bus in panel and to each device supplied by the circuit in accordance with NEC requirements. Multi-circuit branch circuits in same conduit require only one equipment ground.

E. Equipment ground conductor shall be copper with Type THHN insulation, green only, up to and including #4; larger sizes may be bare conductor, or black and identified with green tape.

F. Motors shall be grounded by connecting a bare conductor from the motor frame to the grounding terminal on the connector for rigid to flexible conduit. Ground connector for motor equipment shall be at least 50 percent of the total copper per phase of the largest feeder to the equipment and grounded. Minimum size ground conductor shall be # 12 wire.

G. All Type SO cord, or equivalent, shall have a separate ground wire (green) of equal size to circuit conductor.

H. Paint, grease or other contaminates shall be cleaned from all surfaces before bonding ground conductor. (Painted surfaces shall be sanded clean.)

I. Ground each separately-derived system neutral to nearest effectively grounded metallic water pipe or the nearest effectively grounded building structural steel member.

J. Provide a #6 AWG Copper conductor at each column base for the grounding of future raised floor pedestals. Grounding conductors are to be attached to columns in the manner described in this specification section. Provide minimum 6'-0" conductor length left out of column enclosure for future attachment.

K. Provide a ground bar assembly mounted to the wall in each tel/data closet and computer room. Provide a #6 AWG copper conductor from each ground bar assembly to the nearest building structural steel member.

L. All metal roofs, veneers, and sidings on buildings shall be made electrically continuous and shall be grounded in at least two locations on the opposite sides of the building in conformance with Article 250 of the latest edition of the NEC. Coordinate with roofing contractor for this work.

3.3 GROUNDING ELECTRODES

A. The grounding electrodes shall be as shown on the drawings, utilizing the main water system, the building steel and as detailed, bonded to the main ground bar in the electrical room. Ground rods are to be driven 4" below ground surface, separated 12' from one another and from building wall. Conductors from the main ground bar shall be insulated and installed in rigid PVC conduit.

B. All connections to all underground connections shall be done by exothermic welding process, "Cadweld" or equal.

C. Use 3/4" x 10' copper weld ground rods, driven 4" below ground surface, at each column location indicated on the drawings around perimeter of the building. Weld grounding conductors to grounding electrodes. Conceal grounding conductors within building construction above grade. Provide #4/0 bare copper ground loop around perimeter of building connecting all grounding electrodes together and to building electrical grounding system.

3.4 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance to ground is over 5 ohms, drive additional ground rods (number as required) to reduce resistance to 5 ohms. If resistance to ground is still over 5 ohms, chemically treat the soil encircling the ground rods then retest to demonstrate compliance. Final testing by EC shall be performed in the presence of the Engineer.

END OF SECTION 260451

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260470

CIRCUIT BREAKER PANELS

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of Circuit Breaker Panels as shown on the drawings, and/or specified herein.

1.3 QUALITY ASSURANCE

A. All circuit breaker panels and branch breakers must be UL listed.

B. Circuit breaker panels must meet the NEC wire bending space requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Unless described otherwise, provide flush (surface where indicated) mounted circuit breaker type panels. Panel fronts are to have a door (circuit breakers) in door (circuit breakers & wiring gutters) in trim with concealed hinges and flush type tumbler lock. All panels shall be keyed alike. Doors in excess of 48" high shall be equipped with a three-point catch and vault handle with integral tumbler lock. Panel shall be dead front, safety type and be multi-section as noted or as necessary to comply with NEC.

B. Multi-section panels shall have a single cover with a separate door for each section.

C. Panels shall be equipped as shown on panel schedule with:

1. Main Switch: Where called for or required by NEC - Capacity same as busbars, except as noted. (M.L. = main lugs only; M.A. = main same amps as busbars; figure = ampacity of main device).
2. Main busbars: Number and capacity noted, with suitable lugs for conductors feeding same. On multi-section panels, mains in each section shall be size as noted.
   a. All Panels - Main, distribution, sub-distribution, light and power shall have full capacity copper busbars through out, of size called for in panel schedule.
   b. Provide sub-feed lugs on panels as indicated on panel schedules.
   c. Feed through busbars are prohibited.

3. Ground: Solid copper bar with lug for each branch circuit, main, and bond to panel frame.
4. Neutral: Solid copper bar with lug for each branch circuit.
5. Branch Circuits: Circuit breakers shall be the thermal magnetic type (with thermal element in each pole) with the frame size, ampere rating and number of poles indicated on the drawings. Multiple-pole breakers shall operate on a common-trip principle. Breakers shall be rated minimum 42,000 ampere I.C. (unless otherwise noted). Also note special ground fault requirements specified or depicted on the drawings. Circuit breakers are to be bolt-on molded case, thermal-magnetic trip, with UL Listed RMS symmetrical interruption ratings as per drawings. All circuit breakers feeding heating, air-conditioning, or refrigeration equipment must be "HACR" rated circuit breakers. All circuit breakers feeding bedroom branch circuits in residential construction must be "AFCI" type circuit breakers. See electrical panel schedule notes on drawings.

D. Make and Construction:
   a. Eaton
   b. General Electric Co.
   c. Siemens Energy & Automation, Inc.
   d. Schenider Electric (Square D)
   e. or Engineer approved equal.

1. Cabinets - Code gauge steel with all surfaces prime coated and painted with two coats of standard gray paint for surface mounted panels. Oversize cabinets to accommodate submetering CT's and PT's.
2. Provide NEMA 3R rated panels in all exterior locations and NEMA 4X rated panels in all wet locations such as garage bays, loading docks, kitchens, etc.
3. A paracentric lock with spring catch is to be furnished for door. Provide two keys per lock and key all locks alike.
4. A circuit directory card and card holder on the inside of each door.
5. Branch circuit breakers shall be numbered to correspond with numbering shown on drawings.
6. All parts of equipment must be by same manufacturer.
7. All panels, including the main distribution panel, shall be by the same manufacturer.

E. See drawings for required Circuit Breaker Panels and sizing information.

2.2 SUB-METERING.

A. Power Meter – Basis of Design SHARK 200T.

1. The meter shall be UL listed and CE marked. Meter shall have third party certification or testing for the following standards:

2. ANSI C12.20 .2 Accuracy Class Certified.

3. ANSI C62.41.

4. FCC, Part 15, Subpart B, Class A.

5. EN 61326-1 and CE subordinate standards.

6. IEC 61850 Certified

B. Meter shall be designed for multifunction electrical measurement on 3 phase power systems.

1. The meter shall support 3 element Wye, 2.5 element Wye, 2 element Delta, 4 wire Delta systems.

2. Voltage inputs are user programmable for voltage range to any PT ratio.

3. Voltage burden of .36 VA per phase Max at 600 volts and 0.014 VA at 120 volts.

4. Absolute voltage input range of (20-576) V L-N and (0- 721) Volts L-L.

5. Color-coordinated voltage and current inputs.

6. Phasor diagram that clearly shows wiring status.

7. Dual input method for current inputs:

a. CT allowed to pass directly through meter without any physical termination on meter.

b. Provides additional termination pass-through bars, allowing CT leads to be terminated on meter.

8. Fault current withstand of 100 A for 10 seconds, 300 A for 3 seconds, and 500 A for 1 second.

9. Current programmable to any CT ratio.

10. Current burden of 0.005 VA per phase, Max at 11 A.

11. 1mA and 5mA pickup for current for appropriate current class

12. Inputs and outputs galvanically isolated to 2500 V AC.

13. Current inputs for Class 10: 5 A Nominal CT with overrange to 10 A secondary.

14. Current inputs for Class: 2 1 A Nominal CT with overrange to 2 A secondary.

C. Meter shall have accuracy of +/- 0.2% or better for voltage and current, and 0.2% for power and energy. Meter shall meet accuracy requirements of IEC 62053-22 (Class 0.2S) and ANSI C12.20 (Class 0.2 CL). Meter shall have a frequency accuracy of +/- 0.007 Hz to support frequency control.

D. Meter shall be a traceable revenue meter, containing a utility-grade test pulse for accuracy verification.

1. Meter shall have CT/PT compensation.

2. Meter shall have transformer and line loss compensation.

E. Meter shall have upgrade packs (V1-V6) that enable additional features in the field, without removing the meter from installation.

F. Meter shall have datalogging and PQ recording memory. Available logs shall consist of:

1. Three separately programmable historical trending logs of up to 64 parameters, each.

2. I/O change log of up to 2048 relay output and input status changes.

3. Limits/Alarm log of up to 2048 events.

4. System events, anti-tampering log.

G. Meter shall have simultaneous voltage and current waveform recording.

1. 512 samples per cycle shall be available.

2. PQ triggers shall be based on a 1/2 cycle updated RMS.

3. Up to 170 waveform events can be recorded before the memory fills.

H. Meter shall provide a waveform scope for viewing voltage and current real time waveforms.

I. Meter shall provide harmonic recording to the 40th order and harmonic analysis using stored waveforms to the 255th order.

J. Meter shall store an independent CBEMA or SEMI F47 log.

K. Meter shall fully support MV90 software manufactured by Itron.

L. Meter shall provide 16 configurable limits with control output relays for alarms.

M. Meter shall have communication and I/O expandability through two option card slots on meter. Meter shall auto-detect presence of cards. Up to two cards of any type can be used in the meter.

1. Ethernet option card shall support NTP time server for high accuracy time sync, 12 simultaneous Modbus TCP/IP connections and 5 simultaneous DNP3 over TCP/IP connections. The card shall also support an embedded HTML5-based web server, email on alarm and periodic notification emails of meters status, and Exclusive Client to protect from unauthorized access.

2. IEC 61850 protocol option card shall support simultaneous IEC 61850, and Modbus TCP/IP, 5 simultaneous MMS clients, 5 simultaneous Modbus connections, a web server for status and configuration, multiple logical nodes, a configurable CID file, and Exclusive Client to protect from unauthorized access.

3. Fiber optic option card shall offer either ST-terminated or versatile link terminated, shall contain built-in logic to mimic RS485 half duplex bus for daisy chaining for both Modbus and DNP3.

4. There shall be I/O option cards consisting of 4 channel bi-directional 0-1 mA outputs, four channel, 4-20 mA outputs, four pulse outputs/four status inputs, and two relay outputs/two status inputs.

N. Meter shall have standard RS485 port with Modbus and DNP3 support and a standard KYZ pulse. A faceplate IrDA port shall be available for configuration and data download.

O. Meter shall provide user configured fixed window or rolling window demand so the user can set up the specific utility demand profile.

1. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features. All other parameters shall offer max and min capability over the user selectable averaging period.

2. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.

P. Meter shall have a three-line, bright red, .56" LED display, which presents a scrolling display of measured readings.

Q. Meter shall install in standard ANSI or DIN cutouts. There shall be a transducer only model that shall install on a DIN rail.

R. Meter shall have a 4-year warranty.

2.3 WARNING SIGNS

A. Provide a painted embossed aluminum "WARNING - Arc Flash and Shock Hazard - Appropriate PPE Required" sign which comply with ANSI Z535.4-1998 on the inside face of the panel cover above the panel directory. These signs shall also include the specific parameters of the hazard and the PPE level for the working personnel. The sign shall be similar to the following, with all spaces completed for each specific piece of equipment:

WARNING
Arc Flash and Shock Hazard
Appropriate PPE Required

"__" inch	Flash Hazard Boundary
"__"	cal/cm2 Flash Hazard at "__" inches
"__"	PPE Level, _____
	_____
"____VAC"	Shock Hazard when cover is removed
"__" inch	Limited Approach
"__" inch	Restricted Approach - _____
"__" inch	Prohibited Approach - _____

Equipment Name: "_____"

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure. Install panelboards straight and true. Center interior in trim opening. Properly support, secure and adjust panelboards and trims. Unless otherwise indicated, install panelboards with top circuit breaker handle six feet, six inches above finished floor.

C. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Provide electrical connections within enclosures.

D. Fill out panelboard's circuit directory card upon completion of installation work. See Section 260040, "Electrical Identification".

E. Install submetering on panelboards indicated on one line diagram

3.2 INSTALLATION OF BASIC IDENTIFICATION

A. Panelboards shall be identified on the front cover with its name and available voltage. Identification shall be in the form of laminated plastic nameplates, black face with the letters engraved into the white background (red face for emergency panels), minimum 1/4" high. Plates shall be drilled on each end for sheet metal screw attachment. No "DYMO" or similar tape type labels will be allowed.

The following is an example of the nameplate layout:

PANEL LP1B
208/120 VOLT, 3 PHASE, 4-WIRE

3.3 INSTALLATION OF WARNING SIGNS

A. The contractor shall hire the panelboard manufacturer to perform a short-circuit and arc-flash hazard study to obtain the data required to properly size the panelboards and install the proper warning signs with the proper completed data.

END OF SECTION 260470

SECTION 260472

ELECTRONIC GRADE PANELBOARDS

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 DESCRIPTION.

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of Electronic Grade Panelboards as shown on the drawings, and/or specified herein.

1.3 QUALITY ASSURANCE

A. All electronic grade panelboards must be UL 67, 1449 and 1283 listed.

B. All branch circuit breakers must be UL listed.

C. Electronic grade panelboards must meet the NEC wire bending space requirements.

D. The manufacturer shall provide a limited 5-year warranty against failure when installed in compliance with the unit installation instructions.

1.4 SUBMITTALS

A. Submit manufacturer's product data for electronic grade panelboards including branch breakers, surge suppression system, filter system, and internal overcurrent protection for the suppression/filter system.

PART 2 PRODUCTS

2.1 MATERIALS

A. Unless described otherwise, provide flush (surface where indicated) mounted circuit breaker type panels. Panel fronts are to have a door (circuit breakers) in door (circuit breakers & wiring gutters) in trim with concealed hinges and flush type tumbler lock. All panels shall be keyed alike. Doors in excess of 48" high shall be equipped with a three-point catch and vault handle with integral tumbler lock. Panel shall be dead front, safety type and be multi-section as noted or as necessary to comply with NEC.

B. Panels shall be equipped as shown on panel schedule with:

1. Main Switch: Where called for or required by NEC - Capacity same as busbars, except as noted. (M.L. = main lugs only; M.A. = main same amps as busbars; figure = ampacity of main device).

2. Main Busbars: Number and capacity noted, with suitable lugs for conductors feeding same.
   a. All Panels shall have full capacity copper busbars through out, of size called for in panel schedule.
3. Ground: Copper safety ground bus as well as an Insulated, Isolated solid copper bus with a lug for each branch circuit.
4. Neutral: 200% Solid copper bar with lug for each branch circuit.
5. Branch Circuits: Circuit breakers shall be the thermal magnetic type (with thermal element in each pole) with the frame size, ampere rating and number of poles indicated on the drawings. Multiple-pole breakers shall operate on a common-trip principle. Breakers shall be rated minimum 42,000 ampere I.C. (unless otherwise noted). Circuit breakers are to be bolt-on molded case, thermal-magnetic trip, with UL Listed RMS symmetrical interruption ratings as per drawings. See electrical panel schedule notes on drawings.

C. Transient Voltage Surge Suppression:

1. The TVSS shall not generate any appreciable audible noise.
2. The unit shall not generate any appreciable magnetic fields and shall be suitable for use directly inside computer rooms.
3. The TVSS maximum continuous operating voltage shall be greater than 115% of the nominal system voltage to ensure the ability of the system to withstand temporary RMS overvoltage (swell) conditions.
4. Surge Current Capacity: The TVSS surge current capacity, based on an 8 x 20 microsecond waveform shall be a minimum of 80 kAmps per Mode and 160 kAmps per Phase.
5. The operating frequency range of the system shall be at least 47 to 63 Hertz.
6. Protection Modes shall be L-N, L-L, L-G, and N-G.
7. The TVSS surge current capacity, based on an 8 x 20 microsecond waveform shall be 40KA L-N + 40KA N-G.
8. The system performance ratings shall be based on the UL 1449 listing ratings for IEEE C62.41 C62.41 Category B3 impulse waveforms of 6kV 1.2 X 50 microseconds, 3kA 8 x 20 microsecond waveshapes. The maximum UL 1449 listed surge rating for each and all of the specified protection modes shall not exceed 400 Volts.
9. The TVSS system shall provide a joule rating that meets or exceeds the requirements of ANSI/IEEE C62.41 Category C delivery capability.
10. The TVSS/Filter unit shall provide noise attenuation for electrical line noise of 50 dB (at 100kHz) per 50 Ohm measurement method with a frequency range of 10 kHz to 100 MHz. The unit shall be complimentary listed to UL 1283.
11. Typical response time of all suppression components shall be .5 nanoseconds.

D Make and Construction:

1. Acceptable Manufacturers:
   a. Advanced Protection Technologies SPP Series
   b. Control Concepts Corp. LPG Series
   c. Current Technology Inc. EGP80 Series
   d. LEA International MDP Series

2. Cabinets - Code gauge steel with all surfaces prime coated and painted with two coats of standard gray paint for surface mounted panels.
3. A paracentric lock with spring catch is to be furnished for door. Provide two keys per lock and key all locks alike.
4. A circuit directory card and card holder on the inside of each door.
5. Branch circuit breakers shall be numbered to correspond with numbering shown on drawings.

E. See drawings for required Circuit Breaker Panels and sizing information.

2.2 METERING (Basis of Design: Honeywell E-Mon Class 3400 Meter(s))

A. Meter shall be fully electronic with 4-line by 20-character backlit LCD display showing kwh, kW demand (with peak date and time), power factor per phase, real-time load in kW, Amps per phase and Volts per phase.

B. Meter shall utilize 0-2 volt AC output current sensors to allow paralleling and/or mounting up to 500 feet from the meter. Sensors shall be of split-core configuration to allow installation without disconnecting cabling, etc. Sensors shall be available from 100 amp to 3200 amp. Sensors shall be optionally available in solid-core configuration (100 & 200 amp.)

C. Meter shall be field programmable for meter date/time, IP address and ID code for communication option and optional load control settings.

D. Meter shall provide installation diagnostics on display.

E. Meter shall be enclosed in a NEMA 4X polycarbonate enclosure (standard) with padlocking hasp & mounting flanges for indoor/outdoor installation (stand alone) with one 1 1/16" KO on bottom of enclosure. Optional heavy duty JIC steel enclosure available for indoor installation.

F. Meter shall be UL/CUL listed to latest applicable standards for safety.

G. Meter shall meet or exceed ANSI C12.20 accuracy standards.

H. Meter shall meet or exceed MID accuracy standards.

I. Meter shall provide non-volatile memory to maintain reading during power outages.

J. Meter shall be equipped with an RS-485 Port Ethernet Port and shall be capable to operate with the following protocols: EZ7, Modbus RTU, Modbus TCP/IP , BACnet IP. BACnet MS/TP

K. Meter shall store interval data for kW and kVAR for up to 72 days in first-in first-out format. Interval data not available via BACnet or LonWorks.

L. Meter shall provide optional 5th & 6th channel for logging inputs from third-party metering devices (gas, water, BTU, etc.) Both channels provide interval data logging that can be read via E-Mon Energy software and Modbus.

M. Meter shall be capable of daisy-chain connection using RS-485 communications in combinations of Din-Mon D2 & D5, Class 3200s, 3400s, 5000s, IDR-8s, IDR-16s not to exceed 52 devices. Cabling shall be available through terminal block (3-conductor), 18-22 AWG, up to 4,000 cable feet total.

N. Meter shall be BTL certified.

2.3 WARNING SIGNS

A. Provide a painted embossed aluminum "WARNING - Arc Flash and Shock Hazard - Appropriate PPE Required" sign which comply with ANSI Z535.4-1998 on the inside face of the panel cover above the panel directory. These signs shall also include the specific parameters of the hazard and the PPE level for the working personnel. The sign shall be similar to the following, with all spaces completed for each specific piece of equipment:

WARNING
Arc Flash and Shock Hazard
Appropriate PPE Required

"__" inch	Flash Hazard Boundary
"__"	cal/cm2 Flash Hazard at "__" inches
"__"	PPE Level, _____
	_____
"____VAC"	Shock Hazard when cover is removed
"__" inch	Limited Approach
"__" inch	Restricted Approach - _____
"__" inch	Prohibited Approach - _____

Equipment Name: "_____"

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Provide Electronic Grade Panelboards for panels **CP-1** & **CP-2**. Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure. Install panelboards straight and true. Center interior in trim opening. Properly support, secure and adjust panelboards and trims. Unless otherwise indicated, install panelboards with top circuit breaker handle six feet, six inches above finished floor.

C. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Provide electrical connections within enclosures.

D. Fill out panelboard's circuit directory card upon completion of installation work. See Section 260040, "Identification".

3.2 INSTALLATION OF BASIC IDENTIFICATION

A. Panelboards shall be identified on the front cover with its name and available voltage. Identification shall be in the form of laminated plastic nameplates, black face with the letters engraved into the white background, minimum 1/4" high. Plates shall be drilled on each end for sheet metal screw attachment. No "DYMO" or similar tape type labels will be allowed.

The following is an example of the nameplate layout:

PANEL CP-1
480/277 VOLT, 3 PHASE, 4-WIRE

3.3 INSTALLATION OF WARNING SIGNS

A. The contractor shall hire the panelboard manufacturer to perform a short-circuit and arc-flash hazard study to obtain the data required to properly size the panelboards and install the proper warning signs with the proper completed data.

END OF SECTION 260472

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260475

FUSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of the Fuses, as shown on the drawings, and/or as specified herein required for equipment's operation, and/or required by the NEC.

1.3 QUALITY ASSURANCE

A. All fuses shall be UL listed.

B. ANSI Compliance: Comply with applicable requirements of ANSI C97.1 pertaining to low-voltage cartridge fuses.

C. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of overcurrent protective devices.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

E. Product Data: For each type of product. Include construction details, and material descriptions include the following for each fuse type indicated:

1. Catalog sheets.

2. Specifications.

3. Installation instructions.

1.05 MAINTENANCE

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. 1. Fuses: Six spare fuses of each size and category, including any accessories required for a complete installation.

C. 2. Special tools if required for installation or removal of fuses

PART 2 PRODUCTS

2.1 MATERIALS

A. All circuits above 600 amperes, except where otherwise shown on the drawings, shall be protected by time-delay, current limiting fuses to interrupt fault currents of up to 200,000 amperes symmetrical. These fuses shall hold five hundred percent (500%) of rated current for a minimum of four (4) seconds, and must open at twenty (20) times rated current in 0.01 seconds or less. Fuses shall be Bussmann Low-Peak Class L, fuses, or as scheduled on the drawings.

B. All circuits, 600 amperes or less, except where otherwise shown on the drawings, shall be protected by dual-element current limiting fuses to interrupt fault currents of up to 200,000 amperes symmetrical. In addition, these fuses shall hold five hundred percent (500%) of rated current for a minimum of ten (10) seconds, and provide thermal protection against poor contact conditions. Fuses shall be Bussman Low-Peak fuses, "Class R" or as scheduled on the drawings.

C. Fuses for individual motor circuits, except where otherwise shown on the drawings, shall be approximately 125% of the motor full load current but shall not exceed 175% of the full load current. Fuses shall be Bussman Low-Peak or Fusetron Fuses. "Class RK" dual-element, time delay fuses.

D. Upon completion of the project, the EC shall furnish the following spare fuses and a spare fuse cabinet(s) installed adjacent to all switchboards. Bussman type SFC.

1. Ten (10) percent of each type and ampere rating.
2. A minimum of three (3) fuses of each type and ampere rating.

END OF SECTION 260475

SECTION 26051

MEDIUM-VOLTAGE 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 cables and related cable splices, terminations, and accessories for medium-voltage (2001 to 35,000 V) electrical distribution systems.

1.3 DEFINITIONS

A. Jacket: A continuous nonmetallic outer covering for conductors or cables.

B. NETA ATS: Acceptance Testing Specification.

C. Sheath: A continuous metallic covering for conductors or cables.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

E. Qualification Data: For Installer and testing agency.

F. Material Certificates: For each type of cable and accessory.

G. Design Data: Cable pulling calculations, including conduit size and fill percentage, pulling tensions, cable sidewall pressure, jam probability, voltage drop, and ground wire sizing for each cable.

H. Obtain prior approval from Central Hudson Gas & Electric for proposed medium voltage cables.

1.5 QUALITY ASSURANCE

A. Installer: Engage a cable splicer, trained, and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

C. If brand names other than those specified are proposed for use, furnish the AEIC core and thermo-mechanical qualification test reports. Include a list of 5 Completed Installations indicating name of facility contact person with phone number, voltage, size, and length of EPR cable installed.

D. Equipment Qualifications for Products Other Than Those Specified:
1. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.

2. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.

3. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements. Include proof that the installed cables:

a. Have the same rating and construction as the proposed cable.
b. Have the same insulation compound as the proposed cable.

E. Company Field Advisor: Secure the services of the cable manufacturer's Company Field Advisor for a minimum of 8 working hours for the following:

1. Render advice regarding method of installing cable.
2. Inspection of equipment for installing cable.
3. Witness representative amount of cable pulling.
4. Witness construction of at least one splice and one termination by each cable splicer who will be doing the actual cable splicing.

a. If the splices or terminations are other than the cable manufacturer's, secure the services of the splice and termination manufacturer's Company Field Advisor to concurrently witness construction of the splices and terminations and also certify with an affidavit that the splices and terminations were constructed in accordance with the splice and termination manufacturer's recommendations.

5. Witness high voltage after installation test.
6. Certify with an affidavit that the aforementioned particulars are satisfactory, and the cable is installed in accordance with cable manufacturer's recommendations.

F. Testing Company: Secure the services of an independent International Electrical Testing Association (NETA) accredited testing company for a high voltage after installation test.

G. Factory Inspection of Ethylene-Propylene Insulated Cables (For Brand Names Other Than Those Specified):

1. An inspector from an independent cable testing laboratory designated by the Director shall witness AEIC electrical tests required for completed cables (ac and dc voltage withstand, partial discharge, jacket spark test, and insulation resistance).
2. Have applicable AEIC qualification tests available for use by the cable inspector to evaluate the tests being made on the completed cable.
3. Request name of independent testing laboratory at least 2 weeks before cable is to be tested. Arrange directly with the testing laboratory for the cable inspector's visit to factory. Pay all expenses.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2 and NFPA 70.

C. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 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. General Cable; Prysmian Group North America.
2. Okonite Company (The).
3. Prysmian Cables and Systems; Prysmian Group North America.
4. Southwire Company.
5. Or equal.

B. Cable Type: Type MV 90**.**

C. Conductor Insulation: Ethylene-propylene rubber.

1. Voltage Rating: 1**5** kV.
2. Insulation Thickness: 133 percent insulation level.
3. Insulation: Ethylene Propylene rubber (EPR), 105C, colored to contrast with the shield layers. The nominal insulation thickness shall 220 mils for 15kv. Physical and electrical properties of the insulation shall be in accordance with ICEA S-97-682 for Class III insulation.

D. Conductor: 2 AWG aluminum: 7-wire compressed or concentric round stranding, with 15 mils conductor shield, 220 mils cross linked polyethylene insulation, 30 mils insulation shield and 10 #14 AWG copper concentric neutral applied spirally around the cable with a 55 mils jacket applied over the neutral conductor.

E. Cable jacket shall be black, marked with three red stripes spaced 120 degrees apart, extruded 25 mils deep into the jacket for identification purposes. Cables in conduit shall have a non-conducting jacket. This will distinguish it from a polyethylene gas pipe and other cables, which may be in the same area. All primary cables shall be field tested in accordance with the manufacturer's recommendations.

F. for testing the electrical integrity of the insulation. The field test shall be made after the installation is complete.

G. Comply with ANSI/ICEA S-94-649 with insulation rated for 90°C continuous duty, UL 1072, AEIC CS8**,** ICEA S-93-639/NEMA WC 74, and ICEA S-97-682, and ICEA S-94-649. Deviation from these specifications without prior approval from Central Hudson Gas & Electric may result in complete removal and replacement of cable before final connection to grid is performed.

H. Circuit Identification: Color-coded tape (black, red, blue) under the metallic shielding.

I. Cable Jacket: Sunlight-resistant PVC.

2.3 CONNECTORS

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. Adalet.
   2. G&W Electric Company.
   3. nVent (RAYCHEM).
   4. Or equal.

B. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

C. Copper-Conductor Connectors: Aluminum barrel crimped connectors.

2.4 SOLID TERMINATIONS

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. Adalet.
   2. G&W Electric Company.
   3. nVent (RAYCHEM).
   4. Or equal.

B. Ampere Rating: Not less than ampere rating of cable.

C. Voltage Rating: Not less than voltage rating of cable.

D. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.
   1. Cold-shrink sheath seal kit with preformed sleeve openings sized for cable and insulated conductors.

E. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

   1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.

2.5 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. 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 Power.
   2. Elastimold.
   3. nVent (RAYCHEM)
   4. Or equal.

C. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.

D. Load-Break Cable Terminators: Elbow-type units with 200-A-load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

E. Dead-Break Cable Terminators: Elbow-type unit with [**200**] [**600**]-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

F. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.6 SPLICE KITS

A. Description: For connecting medium voltage cables; type as recommended by cable or splicing kit manufacturer for the application.

B. 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. Adalet.
3. G&W Electric Company.
4. Or equal.

C. Standard: Comply with IEEE 404.

D. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, materials, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

1. Splicing kit must be from a single manufacturer.
2. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
3. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
4. Premolded, cold-shrink-rubber, in-line splicing kit.
5. Premolded, EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.
6. Separable multiway splice system with all components for the required splice configuration.
7. Splices Installed in Vaults, Manholes (any wet locations): Waterproof and submersible.

2.7 MEDIUM-VOLTAGE TAPES

A. Description: Electrical grade, insulating tape rated for medium voltage application.

B. 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. G&W Electric Company.
3. nVent (RAYCHEM).
4. Or equal.

C. Ethylene/propylene rubber-based, 30-mil splicing tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

D. Silicone rubber-based, 12-mil self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inches (38 mm) wide.

E. Insulating-putty, 125-mil elastic filler tape. Minimum 1-1/2 inches wide.

2.8 ARC-PROOFING MATERIALS

A. Description: Fire retardant, providing arc flash protection.

B. 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. G&W Electric Company.
3. nVent (RAYCHEM).
4. Or equal.

C. Tape for First Course on Metal Objects: 10-mil- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

D. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, and compatible with cable jacket.

E. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1 inch wide.

2.9 ACCESSORIES

A. Pulling Compounds: As recommended by cable manufacturer.

1. Polywater "A", "G", "J" or "WJ" lubricants, Plymouth/Bishop No. 45 Cable Pulling Lubricant, Aqua-Gel II (Ideal Industries, Inc.) or Aqua-Gel CW (Ideal Industries, Inc.).

B. Tags: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inches high.

1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.

2.10 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inches on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.
2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.
2. Provide all conduits with pull string (mule tape or equivalent). Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.
4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

D. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit; support cables at intervals adequate to prevent sag.

E. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

F. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

G. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.
3. Standoff Insulator: At each terminal junction, with one on each terminal.

H. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:

1. Clean cable sheath.
2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
3. Smooth surface contours with electrical insulation putty.
4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
5. Band arc-proofing tape with two layers of 1-inch- wide half-lapped, adhesive, glass-cloth tape at each end of the arc-proof tape.

I. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

J. Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

3.2 FIELD QUALITY CONTROL

A. High Voltage After Installation Test: (Test Record-Power Cable Proof Test) form (BDC-362).

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections with the assistance of a Company Service Advisor:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
3. Perform direct-current High Potential test of each new conductor according to NETA ATS, Ch. 7.3.3. Do not exceed cable manufacturer's recommended maximum test voltage.

D. Medium-voltage cables will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.3 PRIMARY NEUTRAL

A. When a primary neutral is required use XHHW-2 or THWN-2 insulated cable rated 600 volts.

END OF SECTION 260513

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260573

SHORT-CIRCUIT/COORDINATION/ARC FLASH STUDY

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. Short-Circuit, Protective Device Coordination and Arc Flash Studies

B. Labels

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis.
4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings.
5. IEEE 1015 – Recommended Practice for Applying Low Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
6. IEEE 1584-2004a, IEEE Guide for Performing Arc Flash Hazard Calculations.

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
2. ANSI C37.13 – Standard for Low Voltage ac Power Circuit Breakers Used in Enclosures.
3. ANSI C37.010 – Standard Application Guide for ac High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
4. ANSI C37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
5. ANSI C37.5 – Methods for Determining the rms Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents.

C. The National Fire Protection Association 70, National Electrical Code, latest recognized edition.

1.4 SUBMITTALS

A. Submit in accordance with the requirements of Section 01 33 00.

B. The short-circuit, protective device coordination and arc flash studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of devices and characteristics will be satisfactory.

C. The results of the short circuit, coordination and arc flash studies shall be summarized in a final report. Submit electronic PDF format of the final report.

D. Reports:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations.
2. Descriptions, purpose, basis and scope of the study.
3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.
4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.
5. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.
6. Incident energy level (calories/cm2) for each equipment location and recommended PPE.
7. Comments and recommendations for system improvements, where needed.
8. Executive summary.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. The short-circuit and coordination studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

PART 2 PRODUCTS

2.1 STUDIES

A. Contractor to furnish short-circuit, protective device coordination and arc flash studies as prepared by equipment manufacturer.

2.2 DATA COLLECTION

A. Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit and coordination studies shall furnish the Contractor with a listing of required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and ensure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source contribution may include present and future utility supply, motors, and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.

D. Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A. Use typical conductor impedances based on IEEE Standard 141, latest edition.

B. Transformer design impedances and standard X/R ratios shall be used when test values are not available.

C. Provide the following:

1. Calculation methods and assumptions.
2. Selected base per unit quantities.
3. One-line diagram of the system being evaluated.
4. Source impedance data, including electric utility system and motor fault contribution characteristics.
5. Typical calculations.
6. Tabulations of calculated quantities.
7. Results, conclusions and recommendations

D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low voltage switchgear.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.
8. Energy Storage Units
9. Other significant locations throughout the system.

E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F. Protective device evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Adequacy of transformer windings to withstand short-circuit stresses.
4. Cable and busway sizes for ability to withstand short-circuit heating.
5. Notify Engineer in writing of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.

B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay and instantaneous settings recommended.

E. Plot the following characteristics on the curve sheets, where applicable:

1. Electric utility's protective device.
2. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
3. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.
4. Conductor damage curves.
5. Ground fault protective devices, as applicable.
6. Pertinent motor starting characteristics and motor damage points.
7. Pertinent generator short-circuit decrement curve and generator damage point.
8. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.5 INCIDENT ENERGY STUDY

A. An incident study shall be done in accordance with the IEEE 1584-2004A, "IEEE Guide for Performing Arc Flash Hazard Calculations" as referenced in NFPA 70, "Standard for Electrical Safety in the Workplace", 2008 Revision, in order to quantify the hazard for selection of Personal Protective Equipment (PPE). Simply using the table values from NFPA 70E and assuming fault current levels and clearing times for proper PPE selection is not acceptable. The manufacturer shall assist in selecting appropriate combinations of PPE prior to the final analysis and preparation of equipment labels.

2.6 REPORT SECTIONS

A. Input Data:

1. Utility three-phase and line-to-ground available contribution with associated X/R ratios.
2. Short-circuit reactance of rotating machines with associated X/R ratios.
3. Cable type, construction, size, # per phase, length, impedance and conduit type.
4. Bus duct type, size, length and impedance.
5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance and X/R ratio.
6. Reactor inductance and continuous ampere rating.
7. Aerial line type, construction, conductor spacing, size, # per phase, and length.

B. Short-Circuit Data:

1. Source fault impedance and generator contributions.
2. X to R ratios.
3. Asymmetry factors.
4. Motor contributions.
5. Short circuit kVA.
6. Symmetrical and asymmetrical fault currents.

C. Recommended Protective Device Settings:

1. Phase and Ground Relays:
   a. Current transformer ratio.
   b. Current setting.
   c. Time setting.
   d. Instantaneous setting.
   e. Specialty non-overcurrent device settings.
   f. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
   a. Adjustable pickups and time delays (long time, short time, ground).
   b. Adjustable time-current characteristic.
   c. Adjustable instantaneous pickup.
   d. Recommendations on improved trip systems, if applicable.
3. Incident energy level (calories/cm2) for each equipment location and recommended PPE.

2.07 LABELS

A. Based on the results of the incident energy study, the supplier shall produce and install danger labels for each piece of equipment as specified in Paragraphs 1., 2. and 3. of Section B above, in accordance with ANSI Z535.4-2002. The labels must be readable in both indoor and outdoor environments for at least 3 years and contain the following information as appropriate:

1. Arc hazard boundary (inches).
2. Working distance (inches).
3. Arc flash incident energy at the working distance (calories/ cm2).
4. PPE category and description including the glove rating.
5. Voltage rating of the equipment.

6. Limited approach distance (inches).
7. Restricted approach distance (inches).
8. Prohibited approach distance (inches).
9. Equipment/bus name.
10. Date prepared.
11. Supplier name and address.

PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish conformance with short-circuit and protective device coordination studies.

C. Notify Authority in writing of any required major equipment modifications.

D. Following completion of all studies, acceptance testing and startup by the field engineering service division of the equipment manufacturer, a 2-year warranty shall be provided on all components manufactured by the engineering service parent manufacturing company.

3.2 SAFETY TRAINING

A. The supplier shall provide one day of arc flash safety training that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E. This shall include:

1. Proper use of the system analysis data.
2. Interpretation of hazard labels.
3. Selection and utilization of personal protective equipment.
4. Safe work practices and procedures.

B. The supplier shall provide an outline of the one day training course including training materials at time of quotation. The owner, at its discretion, may require a needs assessment and/or additional training customized to its specific needs. The supplier shall be capable of developing and presenting customized training for approval as required.

C. The supplier shall provide a training certificate to record satisfactory completion by owner's employees for continuing education credits and re-licensing requirements. Satisfactory completion is defined as the student obtaining a minimum of 70% on the post training examination and the ability to work safely if a hands on performance evaluation is provided.

END OF SECTION 260000

SECTION 260900

WIRING OF MECHANICAL EQUIPMENT

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 GENERAL

A. It is the requirement of this specification to have the Mechanical Contractor (MC) provide and install all CONTROL work for this project in accordance with Division 26 Sections. Control wiring may be line voltage or low voltage wiring. Motor starters specified to be supplied by the Mechanical Contractor and not mounted in factory-built cabinets are to be handed over to the Electrical Contractor for mounting. The Electrical Contractor shall be responsible for all the POWER work to the mechanical equipment (not to include any power wiring inside factory supplied control cabinets). Combination motor starter disconnect switches are to be supplied by the Mechanical Contractor and installed by the Electrical Contractor. Disconnect switches not provided by the equipment manufacturers are to be provided by the Electrical Contractor.

B. The CONTROL WORK specifically includ5.es all relays, switches, control valve actuators, damper actuators, wiring and other incidental devices for complete control and interlocking of the mechanical equipment.

C. The POWER WORK specifically includes all conduit, wire, disconnects and other incidental devices for complete power feeds to mechanical equipment.

D. Sizes of motor circuit breakers, and fuses shown on the drawings or in the specifications are based on criteria available at the time of design and are for bidding purposes only.

E. The Mechanical Contractor and the Electrical Contractor shall coordinate these sizes with the motors to actually be installed for correct motor short circuit and overload protection to ensure that the electrical equipment is sufficient for the starting current of the motor; and to ensure compliance with all prevailing electrical codes.

F. The Electrical Contractor shall size circuit breakers and fuses for motors as directed by Mechanical Contractor's coordinating representative. The Mechanical Contractor's shall bear all costs for electric changes caused by equipment substitutions.

G. All control wiring shall be installed in conduit or be neatly bundled and attached securely to the building structure. Wiring above 50-volt must be run in conduit. All NEC Class 2 (current-limited) wiring not installed in conduit shall be plenum rated and UL listed for the intended application.

END OF SECTION

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260921

LIGHTING CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Description of Work: Provide lighting control equipment and devices as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturer's cut sheets and descriptive literature for each type of device or equipment to be used on the project, indicating compliance with specifications. Include typical wiring diagrams.

PART 2 PRODUCTS

2.1 LIGHTING CONTROLS- GENERAL

A. General: Combination of low voltage central lighting control from lighting control panels and distributed lighting controls via one and two zone room lighting power packs working in conjunction with connected occupancy sensors, daylight harvesting photocells, manual on-off and/or dimming switches, preset switches, touch screen digital control stations, etc. for control of interior lighting fixtures as indicated. Line voltage controls also included as indicated.

2.2 DISTRIBUTED LIGHTING CONTROLS

A. General: Controls to include automatic and/or manual controls as indicated. Provide lighting power packs, manual on-off and dimming switches, preset switches, occupancy sensors, etc. as indicated.

B. Dimming: All dimming controls to be 0-10VDC. For each circuit with dimming control, provide definite contact-break on-off control as well, via the lighting power pack.

C. Network: All lighting room controllers and control devices to be connected via separate dedicated Plenum rated Cat-5E Ethernet cabling system.

D. Complete: Provide all necessary components and wiring as required for the specified and indicated control and control sequences.

E. Acceptable Manufacturers: Lithonia nLight, Sensor Switch, Hubbell Controls; or approved equal.

F. Device Color: For wall mount controls, match general wiring device color for the Project. Ceiling mount devices to be white.

G. Lighting Power Packs: (One-zone or two-zone as indicated, with 0-10V dimming).

H. Ceiling Mounted Occupancy Sensors: (Dual-technology).

I. Day Lighting Sensors.

J. Dual Technology Dimming Wall Switch : (Number of zones indicated, with On/Off, Raise and-Lower buttons per zone). Similar to Sensor Switch WSXA MWO.

K. Preset Switches: (Four preset buttons indicated, plus On / Off, raise and lower buttons). Similar to Lithonia nLight Air – rPODLA – Wireless line powered wall switch.

L. Control Cables Between Devices: Cat-5E, pre-terminated with non-booted connectors, plenum-rated, lengths as required Cat5 Plenum rated..

M. Control Cables for 0-10V Diming Circuits to Lighting Fixtures: Class II, size as required, color per Industry standard, plenum-rated.

N. Other Control Cables: As required, plenum-rated.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install all equipment as recommended by the respective manufacturer.

B. Connections: Install and connect all lighting control panels, lighting power packs and associated control devices to each other and to all respective controlled lighting fixtures per the manufacturer's written instructions and for the indicated operation and control. Extend 0-10VDC dimming control wiring from dimmer control to all its respective dimmed lighting fixtures.

C. Programming and Setting Adjustments: Program each device/equipment requiring same. Adjust field of views, sensitivities and time delays as required for optimum control.

D. Control Wiring: Provide all necessary control wiring for total and satisfactory system operation. Low voltage control wiring may be run without conduit only when concealed above suspended ceilings. Neatly support and secure cables to building structure above ceiling. Provide conduit protection wherever cables penetrate fire barriers, are exposed or susceptible to damage.

3.2 OCCUPANCY SENSOR WALL SWITCHES AND OCCUPANCY SENSORS

A. Locations: Install sensors in the general locations indicated. Adjust exact locations if required to comply with manufacturer's recommendations for optimum placement and control.

B. Operation: In general, all general illumination lighting fixtures in a room (or area) are to be controlled by the sensor(s) in the same room (area). Lights shall remain on as long as at least one sensor in room detects occupancy. When occupancy is no longer detected, lights to turn off after set time delay.

3.3 DISTRIBUTED LIGHTING CONTROLS

A. General: Make all line, load and control power connections as indicated and required. Program room controllers and all system components as required, and adjust time schedules (if applicable) and other required settings as directed by Owner and/or Architect/Engineer.

B. Daylighting Control Photocells: Install where indicated (adjust location if required for optimum daylighting control effectiveness), and connect for the indicated control. Aim for optimum daylighting control effectiveness. Program high and low end trims as directed by Architect/Engineer or Owner.

C. Zone Switches: Install where indicated, and connect and program for the indicated control.

D. Preset Switches: Install where indicated, and connect and program for the indicated control. Program each preset per Owner direction.

3.4 OPERATION- LIGHTS CONTROLLED BY LIGHTING CONTROL PANELS

A. General: Lighting levels shall be set based on last time schedule input or remote device input signal. Subsequent inputs shall take precedence over current status.

B. Time Schedule Control: Each lighting control zone may be set to any dimmed level or Off based on date, day and time.

C. Entry Stations: One button to activate programmed preset, second button for off. Station to be enabled/disabled based on time schedule.

D. Digital Touch Screen Lighting Control Stations: Maybe be used to control and all zones and activate presets.

E. Preset Switch Stations: Each preset button shall set any combination of lighting controls zones to pre-programmed dimmed level or Off via the press of the single button.

F. Occupancy Sensor Control: Where indicated, circuits may be controlled by respective room/area ceiling occupancy sensor(s) which shall override all other controls. Occupancy sensors may be enables/disabled based on time schedule.

G. Programming: Program lighting control panel and associated stations as required to achieve the above operation, with exact time schedules and lighting levels to be as prescribed by the Owner.

3.5 OPERATION- LIGHTS CONTROLLED BY DISTRIBUTED LIGHTING CONTROLS

A. General: Lighting levels shall be set based on last remote device input signal. Subsequent inputs shall take precedence over current status.

B. On-Off-Raise-Lower Switch Stations: Each switch shall turn On/Off and set lighting level for all associated lighting fixtures.

C. Occupancy Sensor Control: Where indicated, circuits shall be controlled by respective room ceiling occupancy sensor(s) which shall override all other controls.

D. Programming: Program lighting power packs and associated control stations as required to achieve the above operation.

3.6 LINE VOLTAGE LIGHTING CONTROLS

A. General: Install where indicated and make all required line and load connections.

3.7 TESTS

A. Test all equipment/devices for proper operation. Correct/adjust as required.

3.8 OWNER INSTRUCTION

Instruct the Owner's representative(s) (minimum one four hour sessions) in the operation and maintenance of each type of equipment, to the Owner's satisfaction.

END OF SECTION 265561

SECTION 260995

COMMISSIONING OF ELECTRICAL SYSTEMS

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.

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. This section includes general requirements that apply to implementation of the commissioning process without regard to specific systems, assemblies, and components.

B. Related Sections including the following:

1. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
2. Division 23 Section "Commissioning of HVAC System" for commissioning process activities for commissioning heating, ventilating, air-conditioning, and refrigeration systems, assemblies, equipment and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document, prepared by Architect, that record concepts, calculations, decisions, and product selection used to meet the OPR and to satisfy applicable regulator requirements, standard and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document, prepared by Owner that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Assemblies, Equipment and Components: Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, equipment and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documents to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S REPSONSIBILITIES

A. Contractor and their subcontractors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in "Issues Log."
3. Attend and participate in commissioning team meetings held on a variable basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklist provided by the commissioning authority.
6. Complete paper or electronic construction checklists as Work is completed and provide to the commissioning authority on a monthly basis.
7. Review and accept commissioning process test procedures provided by the commissioning authority.
8. Accomplish commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, CxA will report the failure in the "Issue Log."

F. Prepare and maintain issues log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning process report.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

A. Systems to be commissioned shall include, but not be limited to the following systems and equipment. Contractor shall coordinate with the commissioning agent's Cx plan for a complete list of systems and equipment.

1. Electrical Systems:
   a. Generator.
   b. Double Ended Substation.
   c. UPS
   d. Photovoltaic System
   e. Battery Energy Storage System
   f. Panelboards.
   g. Transformers
   h. Exterior Lighting and Controls
   i. Interior Lighting and Controls.
   j. Site and Building Grounding System.
   k. Lighting Protection System.
2. Electronic Safety and Security Systems:
   a. Fire Alarm System.

END OF SECTION 260995

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 261219

PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. Section includes pad-mounted, liquid-filled, medium-voltage distribution transformers, with primary and secondary bushings within or without air-terminal enclosures.

1.3 DEFINITIONS

A. BIL: Basic Impulse Insulation Level.

B. Bushing: An insulating structure including a central conductor, or providing a central passage for a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purpose of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

C. Bushing Elbow: An insulated device used to connect insulated conductors to separable insulated connectors on dead-front, pad-mounted transformers and to provide a fully insulated connection. This is also called an "elbow connector."

D. Bushing Insert: That component of a separable insulated connector that is inserted into a bushing well to complete a dead-front, load break or nonload break, separable insulated connector (bushing).

E. Bushing Well: A component of a separable insulated connector, either permanently welded or clamped to an enclosure wall or barrier, having a cavity that receives a replaceable component (bushing insert) to complete the separable insulated connector (bushing).

F. Elbow Connector: See "bushing elbow" above.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.

E. Shop Drawings: For pad-mounted, liquid-filled, medium-voltage transformers.

1. Include plans and elevations showing major components and features.

a. Include a plan view and cross section of equipment base, showing clearances, required workspace, and locations of penetrations for grounding and conduits.

2. Include details of equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include single-line diagram.
4. Include list of materials.
5. Include nameplate data.
6. Manufacturer's published time-current curves of the transformer high-voltage fuses, with transformer damage curve, inrush curve, and thru fault current indicated.

F. Qualification Data: For testing agency.

G. Seismic Qualification Certificates: For transformer assembly, 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.

H. Product Certificates: For transformers, signed by product manufacturer.

I. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformer and accessories to include in emergency, operation, and maintenance manuals.

1.6 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.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2.

C. Comply with IEEE C57.12.00.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: The transformers shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.

1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.
3. Component Amplification Factor: 2.5
4. Component Response Modification Factor: 6.0

B. Windings Material: Aluminum.

C. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, fully shielded, separable-elbow type, suitable for plugging into the inserts provided in the high-voltage section of the transformer. Connected in each phase of incoming circuit and ahead of any disconnecting device.

D. Winding Connections: The connection of windings and terminal markings shall comply with IEEE C57.12.70.

E. Efficiency: Comply with 10 CFR 431, Subpart K.

F. Insulation: Transformer kVA rating shall be as follows: The average winding temperature rise above a 30 deg C ambient temperature shall not exceed 65 deg C and 80 deg C hottest-spot temperature rise at rated kVA when tested according to IEEE C57.12.90, using combination of connections and taps that give the highest average winding temperature rise.

G. Tap Changer: External handle, for de-energized operation.

H. Tank: Sealed, with welded-on cover. Designed to withstand internal pressure of not less than 7 psi (50 kPa) without permanent distortion and 15 psig (104 kPa) without rupture. Comply with IEEE C57.12.36.

I. Enclosure Integrity: Comply with IEEE C57.12.28 for pad-mounted enclosures that contain energized electrical equipment in excess of 600 V that may be exposed to the public.

J. Mounting: An integral skid mounting frame, suitable to allow skidding or rolling of transformer in any direction, and with provision for anchoring frame to pad.

K. Insulating Liquids:
1. Less-Flammable Liquids:

a. Edible-Seed-Oil-Based Dielectric: Listed and labeled by an NRTL as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D92. Liquid shall be biodegradable and nontoxic, having passed the Organization for Economic Co-operation and Development G.L.203 with zero mortality, and shall be certified by the U.S. Environmental Protection Agency as biodegradable, meeting Environmental Technology Verification requirements.

L. Sound level shall comply with NEMA TR 1 requirements.

M. Corrosion Protection:

1. Transformer coating system shall be factory applied, complying with requirements of IEEE C57.12.28 & IEEE C57.12.29, in manufacturer's standard color green.

2.3 THREE-PHASE TRANSFORMERS

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. ABB, Power Grids Division.
2. Cooper Industries, Inc.
3. GE Power; General Electric Company.
4. Or equal.

B. Description:

1. 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. Comply with IEEE C57.12.26.

C. Compartment Construction:
1. Double-Compartment Construction: Individual compartments for high- and low-voltage sections, formed by steel isolating barriers that extend full height and depth of compartments, with hinged, lift-off doors and three-point latching, with a stop in the open position and provision for padlocking.

D. Primary Fusing: Designed and rated to provide thermal protection of transformer by sensing overcurrent and high liquid temperature.

1. 150-kV BIL current-limiting fuses, conforming to requirements of IEEE C37.47.
2. Interrupting Rating: 50,000 rms A symmetrical at system voltage.
3. Fuse Assembly: Bayonet-type, liquid-immersed, expulsion fuses in series with liquid-immersed, partial-range, current-limiting fuses. Bayonet fuse shall sense both high currents and high oil temperature to provide thermal protection to the transformer.

4. Provide bayonet fuse assembly with an oil retention valve and an external drip shield inside the housing to eliminate or minimize oil spills. Valve shall close when fuse holder is removed and an external drip shield is installed.
5. Provide a conspicuously displayed warning adjacent to bayonet fuse(s), cautioning against removing or inserting fuses unless transformer has been de-energized and tank pressure has been released.

E. High-Voltage Section: Dead-front design.

1. To connect primary cable, use separable insulated connectors; coordinated with and complying with requirements of Section 260513 "Medium-Voltage Cables." Bushings shall be one-piece units, with ampere and BIL ratings the same as connectors.
2. Bushing inserts:

    a. Conform to the requirements of IEEE 386.
    b. Rated at 200 A, with voltage class matching connectors. Provide a parking stand near each bushing well. Parking stands shall be equipped with insulated standoff bushings for parking of energized load-break elbow connectors on parking stands.
    c. Provide insulated protective caps for insulating and sealing out moisture from unused bushing inserts and insulated standoff bushings.

3. Bushing wells configured for loop-feed application.
4. Access to liquid-immersed fuses.
5. Dead-front surge arresters.
6. Tap-changer operator.
7. Load-Break Switch:

    a. Radial-feed, liquid-immersed type with voltage class and BIL matching that of separable connectors, with a continuous current rating and load-break rating of 200 amperes, and a make-and-latch rating of 12 kA rms symmetrical.

8. Ground pad.

F. Low-Voltage Section:

1. Bushings with spade terminals drilled for terminating the number of conductors indicated on the Drawings, and the lugs that comply with project requirements.

G. Capacities and Characteristics:

1. Power Rating (kVA): 500.
2. Voltage Ratings: Primary: 13.2/7200kV, three phase wye connected – Secondary: 208Y/120V, three phase, 4W, Wye.
3. Taps:

    a. The transformer shall be furnished with full capacity high-voltage taps. The taps shall be +/- 2 - 2½% above and below nominal voltage . The tap changer switch shall be an externally operated switch with a hotstick-operable handle. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in Section 3.3 of ANSI C57.12.26. Taps shall be provided on the higher voltage of dual voltage primary units.

4. Transformer BIL (kV): 95
5. Minimum Tested Impedance (Percent at 85 deg C): 5.75.
6. K-factor: 4 complying with UL 1562.
7. Comply with UL listing requirements for combination classification and listing for transformer and less-flammable insulating liquid.

H. Transformer Accessories:

1. Drain and filter connection.
2. Filling and top filter press connections.
3. Pressure-vacuum gauge.
4. Dial-type analog thermometer with alarm contacts.
5. Magnetic liquid level indicator with high and low alarm contacts.
6. Automatically resetting pressure-relief device. Device flow shall be as recommended by manufacturer
7. Stainless-steel ground connection pads.
8. Machine-engraved nameplate, made of anodized aluminum or stainless steel.

2.4 SERVICE CONDITIONS

A. Transformers shall be suitable for operation under service conditions specified as usual service conditions in IEEE C57.12.00, except for the following:
1. Cooling air temperature exceeds limits.
2. Excessive load current harmonic factor.
3. Operation above rated voltage or below rated frequency.
4. Exposure to explosive environments.
5. Exposure to fumes, vapors, or dust.
6. Exposure to seismic shock or to abnormal vibration, shock, or tilting.
7. Exposure to high or low temperatures.

2.5 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. High-Voltage Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s). Sign legend shall be "DANGER HIGH VOLTAGE" printed in two lines of nominal 2-inch- high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background.
2. Arc Flash Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s), warning of potential electrical arc flash hazards and appropriate personal protective equipment required.

2.6 SOURCE QUALITY CONTROL

A. Provide manufacturer's certificate that the transformer design tests comply with IEEE C57.12.90.

1. Perform the following factory-certified routine tests on each transformer for this Project:

    a. Resistance.
    b. Turns ratio, polarity, and phase relation.
    c. Transformer no-load losses and excitation current at 100 percent of ratings.
    d. Transformer impedance voltage and load loss.
    e. Operation of all devices.
    f. Lightning impulse.
    g. Low frequency.
    h. Leak.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine pad-mounted, liquid-filled, medium-voltage transformers upon delivery.

1. Upon delivery of transformers and prior to unloading, inspect equipment for any damage that may have occurred during shipment or storage.
2. Verify that tie rods and chains are undamaged and tight, and that all blocking and bracing is tight. Verify that there is no evidence of load shifting in transit, and that readings from transportation shock recorders, if equipped, are within manufacturer's recommendations.
3. Verify that there is no indication of external damage and no dents or scratches in doors and sill, tank walls, radiators and fins, or termination provisions.
4. Verify that there is no evidence of insulating-liquid leakage on transformer surfaces, at weld seams, on high- or low-voltage bushing parts, and at transformer base.
5. Verify that there is positive pressure or vacuum on tank. Check pressure gauge; it is required to read other than zero.
6. Compare transformers and accessories received with bill of materials to verify that shipment is complete. Verify that transformers and accessories conform with manufacturer's quotation and shop drawings. If shipment is incomplete or does not comply with Project requirements, notify manufacturer in writing immediately.
7. Verify presence of polychlorinated biphenyl content labeling.
8. Unload transformers carefully, observing all packing label warnings and handling instructions.
9. Open termination compartment doors and inspect components for damage or displaced parts, loose or broken connections, cracked or chipped insulators, bent mounting flanges, dirt or foreign material, and water or moisture.

B. Handling:

1. Handle transformers carefully, in accordance with manufacturer recommendations, to avoid damage to enclosure, termination compartments, base, frame, tank, and internal components. Do not subject transformers to impact, jolting, jarring, or rough handling.
2. Protect transformer termination compartments against entrance of dust, rain, and snow.
3. Transport transformers upright, to avoid internal stresses on core and coil mounting assembly and to prevent trapping air in windings. Do not tilt or tip transformers.

4. Verify that transformer weights are within rated capacity of handling equipment.
5. Use only manufacturer-recommended points for lifting, jacking, and pulling. Use all lifting lugs when lifting transformers.
6. Use jacks only at corners of tank base plate.
7. Use nylon straps of same length to balance and distribute weight when handling transformers with a crane.
8. Use spreaders or a lifting beam to obtain a vertical lift and to protect transformer from straps bearing against enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
9. Exercise care not to damage tank base structure when handling transformer using skids or rollers. Use skids to distribute stresses over tank base when using rollers under large transformers.

C. Storage:

1. Store transformers in accordance with manufacturer's recommendations.
2. Transformers may be stored outdoors. If possible, store transformers at final installation locations on concrete pads. If dry concrete surfaces are unavailable, use pallets of adequate strength to protect transformers from direct contact with ground. Ensure transformer is level.
3. Ensure that transformer storage location is clean and protected from severe conditions. Protect transformers from dirt, water, contamination, and physical damage. Do not store transformers in presence of corrosive or explosive gases. Protect transformers from weather when stored for more than three months.
4. Store transformers with compartment doors closed.
5. Regularly inspect transformers while in storage and maintain documentation of storage conditions, noting any discrepancies or adverse conditions. Verify that an effective pressure seal is maintained using pressure gauges. Visually check for insulating-liquid leaks and rust spots.

D. Examine areas and space conditions for compliance with requirements for pad-mounted, liquid-filled, medium-voltage transformers and other conditions affecting performance of the Work.

E. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will cross section barriers to reach load or line lugs.

F. Examine concrete bases for suitable conditions for transformer installation.

G. Pre-Installation Checks:

1. Verify removal of any shipping bracing after placement.
2. Remove a sample of insulating liquid according to ASTM D923. Insulating-liquid values shall comply with NETA ATS, Table 100.4. Sample shall be tested for the following:

    a. Dielectric Breakdown Voltage: ASTM D877 or ASTM D1816.
    b. Acid Neutralization Number: ASTM D974.

c. Interfacial Tension: ASTM D971.
d. Color: ASTM D1500.
e. Visual Condition: ASTM D1524.
f. Water in Insulating Liquids: Comply with ASTM D1533.

H. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at transformer location.

I. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Provide with precast concrete base 4" thick. Transformer shall be installed level and plumb and shall tilt less than 1.5 degrees while energized.

B. Comply with requirements for vibration isolation and seismic control devices specified in Section 260190 "Supporting Devices " and Section 260195 " Vibration and Seismic."

C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and IEEE C2.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. For counterpoise, use tinned bare copper cable not smaller than No. 4/0 AWG, buried not less than 30 inches below grade interconnecting the grounding electrodes. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors, sized as shown. Keep lead lengths as short as practicable, with no kinks or sharp bends.
2. Fence and equipment connections shall not be smaller than No. 4 AWG. Ground fence at each gate post and corner post and at intervals not exceeding 10 feet. Bond each gate section to fence post using 1/8 by 1 inch flexible braided copper strap and clamps.
3. Make joints in grounding conductors and loops by exothermic weld or compression connector.
4. Terminate all grounding and bonding conductors on a common equipment grounding terminal on transformer enclosure.
5. Complete transformer tank grounding and lightning arrester connections prior to making any other electrical connections.

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Maintain air clearances between energized live parts and between live parts and ground for exposed connections in accordance with manufacturer recommendations.
2. Bundle associated phase, neutral, and equipment grounding conductors together within transformer enclosure. Arrange conductors such that there is not excessive strain that could

cause loose connections. Allow adequate slack for expansion and contraction of conductors.

C. Terminate medium-voltage cables in incoming section of transformers according to Section 260513 "Medium-Voltage Cables."

3.4 KEY INTERLOCK PROCEDURE

A. Remove padlock securing low-voltage compartment door handle.

B. Release pentahead bolts.

C. Obtain key from key interlock provided on the pad mounted high voltage switch and fuse assembly serving the transformer. (High voltage switch must be in the open position before the key can be removed).

D. Insert key into key interlock on transformer low-voltage compartment door and release key interlock.

E. Operate door handle to unlatch and open low-voltage compartment door.

F. Release internal locking device that allows high-voltage compartment door to be opened.

3.5 SIGNS AND LABELS

A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a Company Service Advisor:

1. General Field-Testing Requirements:

   a. Comply with provisions of NFPA 70B Ch. "Testing and Test Methods."
   b. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
   c. After installing transformer but before primary is energized, verify that grounding system at the transformer is tested at specified value or less.
   d. After installing transformer and after electrical circuitry has been energized, test for compliance with requirements.

e. Visual and Mechanical Inspection:

1) Verify equipment nameplate data complies with Contract Documents.
2) Inspect bolted electrical connections for high resistance using one of the following two methods:

a) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

f. Remove and replace malfunctioning units and retest.
g. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

2. Medium-Voltage Surge Arrester Field Tests:

a. Visual and Mechanical Inspection:

1) Inspect physical and mechanical condition.
2) Verify arresters are clean.
3) Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

b. Electrical Test:

1) Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to comply with recommended minimum insulation resistance listed in that table.
2) Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Liquid-Filled Transformer Field Tests:

a. Visual and Mechanical Inspection:

1) Test dew point of tank gases if applicable.
2) Inspect anchorage, alignment, and grounding.
3) Verify bushings are clean.
4) Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
5) Verify that liquid level in tanks is within manufacturer's published tolerances.
6) Perform specific inspections and mechanical tests recommended by manufacturer.

7) Verify presence of transformer surge arresters and that their ratings are as specified.
8) Verify that as-left tap connections are as specified.

b. Electrical Tests:

1) Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; the value of the index shall not be less than 1.0.
2) Perform power-factor or dissipation-factor tests on all windings according to test equipment manufacturer's published data. Maximum winding insulation power-factor/dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.3.
3) Measure core insulation resistance at 500-V dc if the core is insulated and the core ground strap is removable. Core insulation-resistance values shall not be less than 1 megohm at 500-V dc.
4) Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if test shows a different pattern.
5) Measure resistance of each winding at each tap connection, and record temperature-corrected winding-resistance values in the Operations and Maintenance Manual.
6) Perform an applied-voltage test on high- and low-voltage windings-to-ground. Comply with IEEE C57.12.91, Sections 10.2 and 10.9. This test is not required for single-phase transformers and for three-phase Y-Y-connected transformers.
7) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
8) Remove a sample of insulating liquid according to ASTM D923, and perform dissolved-gas analysis according to IEEE C57.104 or ASTM D3612.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After Substantial Completion, if requested by Director's Representative, but not more than six months after Final Acceptance, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Director's Representative, perform seven days of three-phase voltage recording at the outgoing section of each transformer. Use voltmeters with calibration traceable to the National Institute of Science and Technology standards and with a chart speed of not less than 1 inch per hour. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from the nominal value by more than plus or minus 5 percent during test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:

a. Adjust transformer taps.
b. Prepare written request for voltage adjustment by electric utility.

3. Retests: Repeat monitoring, after corrective action is performed, until satisfactory results are obtained.
4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of transformer's electrical power connections.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C.
3. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists results as follows:

a. Description of equipment to be tested.
b. Discrepancies.
c. Temperature difference between area of concern and reference area.
d. Probable cause of temperature difference.
e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
f. Identify load conditions at time of inspection.
g. Provide photographs and thermograms of deficient area.

4. Act on inspection results according to recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Director’s Representative's operations permit. Retest until deficiencies are corrected.

3.8 DEMONSTRATION

A. Engage a Company Service Advisor to train Owner’s Representative's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 261219

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 261323

MEDIUM-VOLTAGE, PAD MOUNTED SWITCHGEAR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. Section includes outdoor metal-enclosed interrupter switchgear.

1.3 DEFINITIONS

A. BIL: Basic Impulse Insulation Level.

1.4 REFERENCES

A. ANSI/IEEE C37 – All applicable portions

B. ANSI/IEEE C57 - All applicable portions including C57.12.28 – Standard for Pad-Mounted Equipment – Enclosure Integrity.

C. ANSI/IEEE C2 – National Electrical Safety Code: All applicable portions including Section 381G

D. NEMA – National Electrical Manufacturer's Association.

1.5 SUBMITTALS

A. Manufacturer's installation instructions shall be provided along with product data.

B. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

C. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Time-current characteristic curves for overcurrent protective devices.

D. Shop Drawings: For medium-voltage, pad mounted switchgear.

1. Include a tabulation of installed devices with features and ratings.

2. Include dimensioned plans and elevations, showing dimensions, shipping sections, and weights of each assembled section. Elevations shall show major components, features, and mimic bus diagram.
3. Include a plan view and cross section of equipment base showing clearances, manufacturer's recommended work space, and locations of penetrations for grounding and conduits. Show location of anchor bolts and leveling channels.
4. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, and location and size of each field connection.
5. Include single-line diagram.
6. Include copy of nameplate.
7. Ratings of the assembled switchgear:

    1. Voltage.
    2. Continuous current.
    3. Short-circuit rating.
    4. BIL.

E. Coordination Drawings:

1. Outdoor Installations:
    1. Dimensioned concrete base, outline of the switchgear, conduit entries, and grounding equipment locations.

F. Seismic Qualification Data: Certificates, for switchgear and control power, 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.

G. Product Certificates: For switchgear, signed by product manufacturer.

H. Source quality-control reports.

I. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchgear and switchgear 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.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Six of each type and rating of fuse used,
2. Touchup Paint: One half-pint containers of paint matching enclosure's exterior finish.
3. Primary Switch Contact Lubricant: One container.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in "Field Quality Control" Article.

B. Equipment Qualifications For Products Other Than Those Specified:

1. At the time of submission provide written notice to the Owner of the intent to propose an “or equal” for products other than those specified. Make the “or equal” submission in a timely manner to allow the Owner sufficient time to review the proposed product, perform inspections and witness test demonstrations.

2. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.

C. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 8 working hours for the following:

1. Render advice regarding the medium voltage pad mounted switch installation, and final adjustment and testing equipment.
2. Witness final system test and then certify with an affidavit that the medium voltage pad mounted switch installation is installed in accordance with manufactures written instructions and is operating properly.
3. Train facility personnel on the operation and maintenance of the medium voltage pad mounted switch (minimum of two 1 hour sessions).
4. Explain available service programs to facility supervisory personnel for their consideration.

D. Service Availability: A fully equipped service organization shall be available to service the completed Work.

1.9 WARRANTY

1. The pad-mounted switchgear shall be warrantied against defects in materials and workmanship for a minimum period of one (1) year from the date of switch being energized. Bidder shall clearly state the manufacturer's standard warranty terms including any options for extended warranties.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The pad-mounted gear shall meet the following ratings and electrical characteristics: KV, Nominal 14.4 KV, Maximum 17.0 KV, BIL 95 Main Bus Continuous, Amperes 600 Three-Pole Interrupter Switches Continuous, Amperes 600 Load Dropping, Amperes 600 Fuses with Integral Load Interrupter Maximum, Amperes 200E Load Dropping, Amperes 200 Short-Circuit Ratings, Amperes, RMS Symmetrical 14,000 At rated Nominal Voltage The momentary and two-time duty-cycle fault-closing ratings of switches, momentary rating of bus, interrupting ratings of fuses, and one-time duty-cycle fault-closing capabilities of fuses with integral load interrupters shall equal or exceed the short-circuit ratings of the pad-mounted gear.

B. The pad-mounted gear shall be rated to withstand a wind load of 110 mph sustained.

C. Comply with IEEE C37.20.3.

D. The pad-mounted gear shall be rated for an ambient temperature range of –30 degrees to +40 degrees Celsius.

E. Certification of Ratings:

1. The manufacturer of the pad-mounted gear shall be completely and solely responsible for the performance of the basic switch and fuse components as well as the complete integrated assembly as rated.

2. The manufacturer shall furnish, upon request, certification of ratings of the basic switch and fuse components and/or the integrated pad-mounted gear assembly consisting of the switch and fuse components in combination with the enclosure.

F. Manufacturers: Subject to compliance with requirements, and approval from National Grid, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. S&C Electric Company
3. Scott
4. Or equal.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: The switchgear shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means the switchgear will remain in place without separation of any parts when subjected to the seismic forces specified and the switchgear will be fully operational after the seismic event.
2. Component Importance Factor: **1.5**.
3. Component Amplification Factor: **2.5**.
4. Component Response Modification Factor: **6.0**.

2.3 ENCLOSURE CONSTRUCTION

A. The pad-mounted gear enclosure shall be of unitized monocoque (not structural- frame-and-bolted-sheet) construction to maximize strength, minimize weight, and inhibit corrosion.

B. The basic material shall be 11-gauge hot-rolled, pickled and oiled steel sheet.

C. All structural joints and butt joints shall be welded, and the external seams shall be ground flush and smooth. The gas-metal-arc welding process shall be employed to eliminate alkaline residues and to minimize distortion and spatter.

D. To guard against unauthorized or inadvertent entry, enclosure construction shall not utilize any externally accessible hardware.

E. The base shall consist of continuous 90-degree flanges, turned inward and welded at the corners, for bolting to the concrete pad/Vault of pre manufactured box pad.

F. The door openings shall have 90-degree flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between doors and door openings to guard against water entry.

G. Enclosure top side edges shall overlap with roof side edges to create a mechanical maze which shall allow ventilation to help keep the enclosure interior dry while discouraging tampering or insertion of foreign objects.

H. A heavy coat of insulating "no-drip" compound shall be applied to the inside surface of the roof to minimize condensation of moisture thereon.

I. Insulating interphase and end barriers of NEMA GPO3-grade fiberglass- reinforced polyester shall be provided for each interrupter switch and each set of fuses where required to achieve BIL ratings. Additional insulating barriers of the same material shall separate the front compartments from the rear compartments and isolate the tie bus (where furnished).

J. Full-length steel barriers shall separate side-by-side compartments.

K. Interrupter switches shall be provided with dual-purpose front barriers. These barriers, in their normal hanging positions, shall guard against inadvertent contact with live parts. It shall also be possible to lift the barriers out and insert them into the open gap when the switch is open. These barriers shall meet the requirements of Section 381G of the National Electrical Safety Code (ANSI Standard C2).

L. Interrupter switches shall be provided with window panels to allow viewing of the switch position without removing the dual-purpose front barriers. Window panels shall be removable to facilitate phasing and shall be secured to the enclosure with stainless-steel hardware.

M. Each fuse shall be provided with a dual-purpose front barrier. These barriers, in their normal hanging positions, shall guard against inadvertent contact with live parts. It shall also be possible to lift these barriers out and insert them into the open gaps when the fuses are in the disconnect position. These barriers shall meet the requirements of Section 381G of the National Electrical Safety Code (ANSI Standard C2).

N. The enclosure shall be provided with an instruction manual holder.

O. Lifting tabs shall be removable. Sockets for the lifting-tab bolts shall be blind- tapped. A resilient material shall be placed between the lifting tabs and the enclosure to help prevent corrosion by protecting the finish against scratching by the tabs. To further preclude corrosion, this material shall be closed-cell to prevent moisture from being absorbed and held between the tabs and the enclosure in the event that lifting tabs are not removed.

P. Inner barrier panels that meet the Rural Electrification Association's requirements for "dead-front" and the requirements of Section 381G of the National Electrical Safety Code (ANSI Standard C2) shall be provided—one for each door opening providing access to high voltage. These panels shall be secured in place with recessed pentahead bolts. When so secured, they shall guard against inadvertent contact with live parts.

Q. A stainless steel-compartmented base spacer shall be provided to increase the elevation of live parts in the pad mounted gear above the mounting pad by 24 inches.

2.4 DOORS

A. Doors shall be constructed of 11-gauge hot-rolled, pickled and oiled steel sheet.

B. Door-edge flanges shall overlap with door-opening flanges and shall be formed to create a mechanical maze that shall guard against water entry and discourage tampering or insertion of foreign objects but shall allow ventilation to help keep the enclosure interior dry.

C. Doors shall have a minimum of two extruded-aluminum hinges with stainless- steel hinge pins, and interlocking extruded-aluminum hinge supports for the full length of the door to provide strength, security, and corrosion resistance. Mounting hardware shall be stainless steel and shall not be externally accessible to guard against tampering.

D. In consideration of controlled access and tamper resistance, each door (or set of double doors) shall be equipped with an automatic three-point latching mechanism.
   1. All latch points shall latch at the same time to preclude partial latching.
   2. A pentahead socket wrench or tool shall be required to actuate the mechanism to unlatch and latch the door.
   3. The latching mechanism shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering and that shall be coordinated with the latches such that: (a) It shall not be possible to unlatch the mechanism until the padlock is removed, and (b) It shall not be possible to insert the padlock until the mechanism is completely latched closed.

E. Doors providing access to solid-material power fuses shall have provisions to store spare fuse units or refill units..

F. Each door shall be provided with a zinc-nickel-plated steel door holder located above the door opening. The holder shall be hidden from view when the door is closed, and it shall not be possible for the holder to swing inside the enclosure.

2.5 FACTORY FINISHING

A. All steel structure components shall be cleaned, rinsed and phosphatized prior to painting.

B. Finish shall be in accordance with ANSI C57.12.28 including Salt spray, Cross Hatch Adhesion, Humidity, Impact, Oil Resistance, Ultra-violet Accelerated Weathering, Abrasion Resistance.

C. Color: Munsell Green No. 7GY3.29/1.5.

2.6 INTERRUPTER SWITCHES

A. Interrupter switches shall have a two-time duty-cycle fault-closing rating equal to or exceeding the short-circuit rating of the pad-mounted gear. These ratings define the ability to close the interrupter switch twice against a three-phase fault with asymmetrical current in at least one phase equal to the rated value, with the switch remaining operable and able to carry and interrupt rated current. Tests substantiating these ratings shall be performed at maximum voltage with current applied for at least 10 cycles. Certified test abstracts establishing such ratings shall be furnished upon request.

B. Interrupter switches shall be operated by means of an externally accessible 3/4" hex switch-operating hub. The switch-operating hub shall be located within a recessed stainless-steel pocket mounted on the side of the pad-mounted gear enclosure and shall accommodate a 3/4" deep-socket wrench or a 3/4" shallow- socket wrench with extension. The switch-operating-hub pocket shall include a pad-lockable stainless-steel access cover that shall incorporate a hood to protect the padlock shackle from tampering. Stops shall be provided on the switch- operating hub to prevent over travel and thereby guard against damage to the interrupter switch quick-make quick-break mechanism. Labels to indicate switch position shall be provided in the switch-operating-hub pocket.

C. Each interrupter switch shall be provided with a folding switch-operating handle. The switch-operating handle shall be secured to the inside of the switch- operating-hub pocket by a brass chain. The folded handle shall be stored behind the closed switch-operating-hub access cover.

D. Interrupter switches shall utilize a quick-make quick-break mechanism installed by the switch manufacturer. The quick-make quick-break mechanism shall be integrally mounted on the switch frame and shall swiftly and positively open and close the interrupter switch independent of the switch-operating-hub speed.

E. Each interrupter switch shall be completely assembled and adjusted by the switch manufacturer on a single rigid mounting frame. The frame shall be of welded steel construction such that the frame intercepts the leakage path which parallels the open gap of the interrupter switch to positively isolate the load circuit when the interrupter switch is in the open position.

F. Interrupter switch contacts shall be backed up by stainless-steel springs to provide constant high contact pressure.

G. Interrupter switches shall be provided with a single blade per phase for circuit closing including fault closing, continuous current carrying, and circuit interrupting. Spring-loaded auxiliary blades shall not be permitted. Interrupter switch blade supports shall be permanently molded in place in a unified insulated shaft constructed of the same cycloaliphatic epoxy resin as the insulators.

H. Circuit interruption shall be accomplished by use of an interrupter which is positively and inherently sequenced with the blade position. It shall not be possible for the blade and interrupter to get out of sequence. Circuit interruption shall take place completely within the interrupter, with no external arc or flame. Any exhaust shall be vented in a controlled manner through a deionizing vent.

I. Interrupter switches shall have a readily visible open gap when in the open position to allow positive verification of switch position.

J. Ground studs shall be provided at all switch terminals. Ground studs shall also be provided on the ground pad in each interrupter switch compartment and on the terminals and ground pad in any bus compartment. The momentary rating of the ground studs shall equal or exceed the short-circuit ratings of the pad-mounted gear.

K. Base-mounted distribution-class surge arresters, metal-oxide type, rated 9 kV shall be provided at all source switch terminals.

L. Switch terminal pads shall accommodate attachment of rod-type compression terminals on cables entering the switchgear.

2.7 FUSES

A. Solid-Material Power Fuses.

1. Fuses shall be disconnecting style, solid-material power fuses, and shall utilize refill-unit-and-holder or fuse-unit and-end-fitting construction. The refill unit or fuse unit shall be readily replaceable and low in cost.

2. Fusible elements shall be non-aging and non-damageable so that it is unnecessary to replace un-blown companion fuses on suspicion of damage following a fuse operation..

3. Fusible elements for refill units or fuse units rated 10 amperes or larger shall be helically coiled to avoid mechanical damage due to stresses from current surges.

4. Fusible elements, that carry continuous current, shall be supported in air to help prevent damage from current surges.

5. Each refill unit or fuse unit shall have a single fusible element to eliminate the possibility of unequal current sharing in parallel current paths.

6. Solid-material power fuses shall have melting time-current characteristics that are permanently accurate to within a maximum total tolerance of 10% in terms of current. Time-current characteristics shall be available which permit coordination with protective relays, automatic circuit reclosers, and other fuses.

7. Solid-material power fuses shall be capable of detecting and interrupting all faults whether large, medium, or small (down to minimum melting current), under all realistic conditions of circuitry, with line-to-line or line- to ground voltage across the fuse and shall be capable of handling the full range of transient recovery voltage severity associated with these faults.

8. All arcing accompanying operation of solid-material power fuses shall be contained within the fuse, and all arc products and gases evolved shall be effectively contained within the exhaust control device during fuse operation.

9. Solid-material power fuses shall be equipped with a blown-fuse indicator that shall provide visible evidence of fuse operation while installed in the fuse mounting.

B. Fuse-mounting jaw contacts shall incorporate an integral load interrupter that shall permit live switching of fuses with a hookstick.

1. The integral load interrupter housing shall be of the same cycloaliphatic epoxy resin as the insulators.
2. The integral load interrupter shall be in the current path continuously. Auxiliary blades or linkages shall not be used.
3. Live switching shall be accomplished by a firm, steady opening pull on the fuse pull ring with a hookstick. No separate load-interrupting tool shall be required.
4. The integral load interrupter shall require a hard pull to unlatch the fuse to reduce the possibility of an incomplete opening operation.
5. Internal moving contacts of the integral load interrupter shall be self- resetting after each opening operation to permit any subsequent closing operation to be performed immediately.
6. Circuit interruption shall take place completely within the integral load interrupter with no external arc or flame.
7. The integral load interrupter and the fuse shall be provided with separate fault-closing contacts and current carrying contacts. The fuse hinge shall be self-guiding and, together with the fault-closing contacts, shall guide the fuse into the current-carrying contacts during closing operations. Circuit-closing inrush currents and fault currents shall be picked up by the fault-closing contacts, not by the current-carrying contacts or interrupting contacts.

8. Integral load interrupters for fuses shall have a one-time duty-cycle fault- closing capability equal to the interrupting rating of the fuse, and a two- time duty-cycle fault-closing capability of 13,000 amperes rms asymmetrical at 14.4 kv or 25 kv. The duty-cycle fault-closing capability defines the level of available fault current into which the fuse can be closed the specified number of times (once or twice), without a quick- make mechanism and when operated vigorously through its full travel without hesitation at any point, with the integral load interrupter remaining operable and able to carry and interrupt currents up to the emergency peak-load capabilities of the fuse.

C. Fuse terminal pads shall accommodate attachment of rod-type compression terminals on cables entering the switchgear.

D. Ground studs shall be provided at all fuse terminals. One ground stud shall also be provided on the ground pad in each fuse compartment. The momentary rating of the ground studs shall equal or exceed the short-circuit ratings of the pad mounted gear.

E. A fuse storage compartment shall be provided in two source interrupter-switch compartments. Each fuse storage compartment shall provide space for storing three spare fuse holders or fuse units with end fittings for solid-material power fuses, or one spare electronic power fuse holder.

2.8 WARNING LABELS AND SIGNS

A. All external doors shall be provided with "Warning—Keep Out—Hazardous Voltage Inside—Can Shock, Burn, or Cause Death" signs.

B. The inside of each door shall be provided with a "Danger—Hazardous Voltage— Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death" sign. The text shall further indicate that operating personnel must know and obey the employer's work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.

C. Interrupter switch compartments shall be provided with "Danger" signs indicating that "Switches May Be Energized by Backfeed.

D. Fuse compartments shall be provided with "Danger" signs indicating that "Fuses May Be Energized by Backfeed.

E. Barriers used to prevent access to energized live parts shall be provided with "Danger—Keep Away—Hazardous Voltage—Will Shock, Burn, or Cause Death" signs.

F. The outside of each door (or set of double doors) shall be provided with a nameplate indicating the manufacturer's name, catalog number, model number, date of manufacture, and serial number. B. The inside of each door (or set of double doors) shall be provided with a ratings label indicating the following: voltage ratings; main bus continuous rating; short- circuit ratings (amperes rms symmetrical and Mva three-phase symmetrical at rated nominal voltage); the type of fuse and its ratings including duty-cycle fault- closing capability; and interrupter switch ratings including duty-cycle fault- closing and short-time (momentary, amperes rms asymmetrical and onesecond, amperes rms symmetrical).

G. A three-line connection diagram showing interrupter switches, fuses with integral load interrupter, and bus along with the manufacturer's model number shall be provided on the inside of each door (or set of double doors), and on the inside of each switch-operating-hub access cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Upon delivery of medium-voltage, pad mounted switchgear and prior to unloading, inspect equipment for damage.
   1. Examine switchgear for external damage, including dents or scratches in doors and sill, and termination provisions.
   2. Compare switchgear and accessories received with the bill of materials to verify that the shipment is complete. Verify that switchgear and accessories conform to the manufacturer's quotation and shop drawings. If the shipment is not complete or does not comply with project requirements, notify the manufacturer in writing immediately.
   3. Unload switchgear, observing packing label warnings and handling instructions.
   4. Open compartment doors and inspect components for damage or displaced parts, loose or broken connections, cracked or chipped insulators, bent mounting flanges, dirt or foreign material, and water or moisture.

B. Handling:

   1. Handle switchgear according to manufacturer's recommendations; avoid damage to the enclosure, termination compartments, base, frame, tank, and internal components. Do not subject switchgear to impact, jolting, jarring, or rough handling.
   2. Protect switchgear compartments against the entrance of dust, rain, and snow.
   3. Transport switchgear upright to avoid internal stresses on equipment mounting assemblies. Do not tilt or tip switchgear.
   4. Use spreaders or a lifting beam to obtain a vertical lift and to protect switchgear from straps bearing against the enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
   5. Do not damage structure when handling switchgear.

C. Storage:

   1. Store switchgear in a location that is clean and protected from weather. Protect switchgear from dirt, water, contamination, and physical damage. Do not store switchgear in the presence of corrosive or explosive gases.
   2. Store switchgear with compartment doors closed.
   3. Regularly inspect switchgear while in storage and maintain documentation of storage conditions, noting any discrepancies or adverse conditions.

D. Examine roughing-in of conduits and grounding systems to verify the following:

   1. Wiring entries comply with layout requirements.
   2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will have to cross section barriers to reach load or line lugs.

E. Pre-Installation Checks:

1. Verify removal of any shipping bracing after placement.

F. Maximum ground resistance shall be 5 ohms at switchgear location.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SWITCHGEAR INSTALLATION

A. Equipment Mounting:

1. Install switchgear on equipment base(s).
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Switchgear shall be installed level and plumb. Switchgear shall tilt less than 1.5 degrees while energized.

C. Maintain minimum clearances at equipment according to manufacturer's written instructions and NFPA 70.

D. Comply with NECA 1.

E. Comply with NECA 430.

3.3 CONNECTIONS

A. Ground equipment according to NEC and manufactures written instructions.

B. Grounding Connections at Exterior Locations:

1. Install tinned bare copper cable not smaller than No. 4/0 AWG, for counterpoise buried not less than 30 inches below grade interconnecting the grounding electrodes.
2. Bond surge arrester and neutrals directly to the switchgear enclosure and then to the grounding electrode system with bare copper conductors, sized as shown.
3. Keep lead lengths as short as practicable with no kinks or sharp bends.
4. Fence and equipment connections shall not be smaller than No. 4 AWG.
5. Where provided ground fence at each gate post and corner post and at intervals not exceeding 10 ft..
   a. Bond each gate section to the fence post using 1/8 by 1 inch tinned **or** flexible braided copper strap and clamps.
6. Make joints in grounding conductors and loops by exothermic weld or compression connector.

C. Terminate all grounding and bonding conductors on a common equipment grounding terminal on the switchgear enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate the number of conductors for termination.

D. Complete switchgear grounding and lightning arrester connections prior to making any other electrical connections.

E. Terminate medium-voltage cables according to Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with the installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with OSHA in 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a Company Service Advisor.

D. General Field Testing Requirements:
1. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

E. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

1. Verify that fuse sizes and types correspond to drawings.
2. Inspect bolted electrical connections using calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
3. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
2) Make key exchange with devices operated in off-normal positions.

4. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
5. Inspect insulators for evidence of physical damage or contaminated surfaces.
6. Verify correct barrier and shutter installation and operation.

7. Exercise active components.
8. Inspect mechanical indicating devices for correct operation.

2. Electrical Tests:

1. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
2. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
2) Do not proceed to the dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

F. Ground Resistance Test:

1. Visual and Mechanical Inspection:

1. Verify ground system complies with the Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."
2. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections shall be free of corrosion.
3. Inspect bolted electrical connections using a calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
4. Inspect anchorage.

2. Electrical Tests:

1. Perform fall-of-potential or alternative test according to IEEE 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground shall be no more than 5 ohms.
2. Inspect physical and mechanical condition.
3. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

G. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

1. Inspect physical and mechanical condition.
2. Inspect bolted electrical connections using calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
3. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
4. Verify the unit is clean.
5. Verify freedom of movement, end play, and alignment of rotating disk(s).

3.6 DEMONSTRATION

A. Engage a Company Service Advisor to train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 261323

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 262212

TRANSFORMERS - DRY TYPE, UNDER 600V

PART 1 GENERAL

1.1 REFERENCES

A. NEMA, ANSI, IEEE, and UL.

1.2 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Submittals Package:
   1. For Transformers Rated over 75KVA: Submit the product data, and quality control submittals preliminary data specified below all at the same time as a package.

C. Product Data: Catalog sheets, specifications and installation instructions, for transformer and transformer pad.

D. Contract Closeout Submittals:
   1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner.

1.3 DELIVERY, STORAGE AND HANDLING

A. Storage of Transformers: Provide supplemental heating devices, such as incandescent lamps or low wattage heaters within the enclosure or under a protective covering to control dampness. Maintain this protection from the time equipment is delivered to the site until it is energized.

B. Store in a warm dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose.

PART 2 PRODUCTS

2.1 DRY TYPE TRANSFORMERS

A. By Acme Electric Corp. Power Products Div., Eaton, General Electric Co., Hammond, Niagara Transformer Corp., Maddox, Sola/Hevi-Duty Unit of General Signal, or Square D Co.:

1. Dry type transformers shall be factory assembled, general purpose, ventilated type of size and electrical characteristics indicated. Transformers shall have copper windings, four (4) primary taps; two (2) 2-1/2 % above and two (2) 2-1/2 % below rated voltage. Transformer(s) shall be K4 rated. Transformers shall be rated for a maximum temperature rise of 80 degrees C. Insulation shall be rated for 220 degrees C.

2. Enclosure For Transformers in Damp or Wet Locations:
   a. Outdoor/ventilated enclosure equipped with weathershields.

3. Mounting accessories: Provide with HDPE pre-manufactured transformer pad minimum height to be 4", length and width as required to suit provided transformer.

4. Lightning arresters connected to primary terminals of transformers (arresters may be mounted in transformer enclosure or in a separate grounded sheet metal enclosure).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install dry type transformers where indicated on the drawings.

B. Set transformer plumb and level.

C. Use flexible conduit, three (3) feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

D. Mount transformer on housekeeping pad, bolt to pad using stainless steel epoxy anchors. Secure transformer pad to concrete pad as directed by pad manufacture installation instructions.

E. Check for damage and tight connections prior to energizing transformer.

F. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

SECTION 262812

SAFETY SWITCHES

PART 1 GENERAL

1.1 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Product Data: Catalog sheets, specifications and installation instructions.

PART 2 PRODUCTS

2.1 SAFETY SWITCHES (SINGLE THROW)

A. NEMA 1: Eaton/ Cutler-Hammer Inc.'s Heavy Duty Series, General Electric Co.'s Heavy Duty Series, Siemens Inc,’s Heavy Duty Series, or Square D Co.'s Heavy Duty Series; having:
1. Fuses, or unfused as indicated on drawings.
2. Fused switches equipped with fuseholders to accept only the fuses specified in Section 262813 (UL Class RK-1, RK-5, L).
3. NEMA 1 enclosure unless otherwise indicated on drawing.
4. 240V rating for 120V, 208V, or 240V, circuits.
5. 600V rating for 277V, or 480V circuits.
6. Solid neutral bus when neutral conductor is included with circuit.
7. Ground bus when equipment grounding conductor is included with circuit.
8. Current rating and number of poles as indicated on drawings.

B. NEMA 4X: Crouse-Hinds Co.'s NST, or Square D Co.'s Heavy Duty Special Application Safety Switches; having:
1. Fuses, or unfused as indicated on drawings.
2. Fused switches equipped with fuseholders to accept only the fuses specified in Section 262813 (UL Class RK-1, RK-5, L).
3. Molded fiberglass-reinforced polyester NEMA 4X enclosure.
4. 240V rating for 120V, 208V, or 240V, circuits.
5. 600V rating for 277V, or 480V circuits.
6. Solid neutral bus when neutral conductor is included with circuit.
7. Ground bus when equipment grounding conductor is included with circuit.
8. Current rating and number of poles as indicated on drawings.

2.2 NAMEPLATES

A. General: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.
   1. Phenolic: Two color laminated engravers stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
   2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
   3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install switches so that the maximum height above the floor to the center of the operating handle does not exceed 6'-6".

B. Indoor dry locations: NEMA 1 enclosures.
Indoor Damp or Wet locations: NEMA 4X enclosure
Exterior locations: NEMA 4X enclosure.

C. Identify each safety switch, indicating purpose or load served:
   1. NEMA 1 Enclosures: Rivet or bolt nameplate to the cover.
   2. NEMA 4X Enclosures: Attach nameplate to the cover using adhesive specifically designed for the purpose, or mount nameplate on wall or other conspicuous location adjacent to switch. Do not penetrate enclosure with fasteners.

D. Paint switches used for the fire protective signaling system with red paint and identify - "FIRE ALARM CIRCUIT CONTROL".

E. Paint switches used for oil burner emergency switch with red paint and identify "OIL BURNER".

END OF SECTION

SECTION 262813

BUS DUCT

PART 1 GENERAL

1.1 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Product Data: Catalog sheets, specifications and installation instructions.

C. Submit certification that busbar, accessories, and components will withstand seismic forces to include the following:
   1. Basis of certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. The term "withstand" means "the units will remain in place without separation of any parts from the device when subjected to the seismic forces specified.".
   3. Dimensioned outline drawings of equipment unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   4. Detailed description of equipment anchorage devices on which the certification is based and the installation requirements.

1.2 STANDARDS

A. Underwriters Laboratory Standard, UL 857 – The common UL, CSA, and ANCE Standard for Busbars that is derived from the fifth edition of CSA Standard C22.2 No. 27, the twelfth edition of UL 857, and the second edition of NMX-J-148-1998-ANCE.
B. NEC Article 364 – Busbar
C. NFPA 70 – National Fire Protection Agency

1.3 ENVIRONMENTAL CONDITIONS

A. The busbar/busway shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage, degradation, or derating of operating capability.
B. Ambient Temperature for electronic components: 32 to 104°F (0 to 40°C)
C. Relative humidity: 0 to 95 percent, noncondensing.

1.4 PERFROMANCE REQUIREMENTS

A. The busbar/busway system shall be available in the following current rating of 160 AMPS, 600V.
B. Insulation voltage: 1000V
C. Short Circuit Rating: Minimum 50K AIC.

1.5 QUALITY ASSURANCE

A. Testing agency qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a national recognized testing Laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. 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.

C. UL compliance: Listed and labeled under UL 857. ETL is not recognized.

D. NFPA compliance: Mark components as suitable for installation in computer rooms according to NFPA 75.

1.6 MANUFACTURES:

A. Basis of design is PowerBar as manufactured by Vertiv.

B. Approved equal as determined by the Engineer

PART 2 PRODUCTS

2.1 BUSBAR ASSEMBLY

A. The lengths provided on the project shall be as recommended and selected by the manufacturer to meet the project requirements.

B. The lengths shall be available in lengths up to 13 feet with option to extend.

C. The top of the busbar shall have a slot running the length of the busbar to provide attachment points for installation of the busbar.

D. The hangers provided with the system should not in any way interfere with the tap off installation, in addition various hangers need to be available for different type of installations to meet individual site needs.

E. The bottom of the busbar shall have a continuous opening to accept the tap off boxes. This opening shall pass the UL and IEC hypothetical finger probe test. The entire opening with the exception of the small area for the joint coupling, shall be available for plug-in/tap off unit insertion.

F. Housing: The busbar housing sections shall be constructed of extruded aluminum and provide 100% rated system earth path that meets UL 857 standard and must comply with applicable paragraphs of Section 250 of the NEC. Steel housings shall not be permitted.

G. The housing shall have a means of containing the smart cabling along its length when required.

H. Conductors: All conductors for amperage ratings up to 600A shall be made of 100% copper. All conductors sized to handle 100% of the busbar rating under continuous operation up to the maximum ambient temperature. The conductors shall be electrically isolated from the housing.

I. Bus: Bus bars shall be fabricated from high strength electrical grade Copper (C101 BS 1432/1433) 99.99% purity to ETP 99.9. Option for aluminum alloy 6101.

J. Shall be capable of carrying rated current continuously up to an ambient temperature of 40°C.

K. Oversized neutral for systems with non-linear loads. The additional capacity prevents overloading caused by zero sequence harmonic currents –available options are:

1. 160A – 200% Oversized Neutral

L. Insulators: Internal conductor shall be electrically isolated from the housing using full length individual insulator of IEC & UL certified halogen free, non-flammable thermoplastic. The insulation must have excellent dielectric strength and is impact resistant.

2.2 TAP OFF BOXES

A. Tap off boxes shall be polarized to avoid incorrect installation.

B. Tap off boxes are capable of being inserted safely when the busbar is energized.

C. All tap off boxes have mechanical/electrical interlocks with "earth first, break last" safety feature.

D. All tap off boxes shall utilize a mechanical/electrical interlock that will prevent an energized plug-in unit from insertion or removal from the busbar and will reduce the risk of arch flash to the operator.

E. The tap off box shall have the option of being hook operated.

F. Tap off boxes serving server room racks shall be provided with a 3P-30 amp circuit breaker and L6-30R receptacle. Prior to ordering confirm receptacle NEMA type with PDU's being provided for this project.

G. Tap off boxes serving av room racks shall be provided with a 1P-20amp circuit breaker and a L5-20R receptacle to serve AV rack mounted PDU units. Prior to ordering confirm receptacle NEMA type with PDU's being provided for this project.

H. Tap off boxes that include drop cords shall be manufactured with cord grips and receptacles as specified on the schedule on the project drawings.

I. Tap off boxes shall be configured by the manufacturer to balance the load based on quantity of tap off box types provided.

J. Tap off boxes shall have at least 125 amps of distribution capacity for all amperage systems.

K. Tap off boxes can be easily added or removed without shutting power down to the busbar. Tap off boxes shall have integral shutters. Verification of compliance shall be provided in writing from manufacturer.

L. Tap off boxes that make a simultaneous mechanical and electrical connection when attached to busbar shall not be permitted.

M. The tap off units shall be compatible for vertical and horizontal mounting of the busway.

N. The tap off units shall be compatible with all current ratings of the busbar/busway system.

O. The required protection device shall be indicated on the manufacturer's submittal drawings.

P. The required outlet device shall be indicated on the manufacturer's submittal drawings.

Q. For tap off boxes requiring drop cords, the cord length shall be specified by the contractor at the time of purchase order. The length shall be the length of the cord and not the pre-assembled outlet.

2.3 END TAP BOX

A. The end feed shall provide the connections from the incoming cables to the Busbar System.

B. The end feed shall be an IP2X enclosure with various access panels for incoming cabling.

C. The end feed shall have an internal connection to a section of Busbar conductors.

D. Provide end caps at each end of bus duct.

2.4 NAMEPLATES

A. General: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.

1. Phenolic: Two color laminated engravers stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install bus duct per manufactures written instructions.

B. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

C. The manufacturer shall provide certified copies of factory test reports upon request.

D. Examine areas and conditions, with installer present, for compliance with requirements for conditions affecting performance of the busbar.

E. Hanging of the busbar shall be done using the busbar hangers from a structure above the busbar. Hangers shall connect to the busbar, and to an all-thread rod provided by the installing contractor.

F. The spacing of the hangers along the busbar is 5 feet or less as recommended by the manufacturer.

G. The end feed shall have connection provisions for the contractor supplied feeder cabling.

H. The end feed shall be connected to the busbar section using a joint kit.

I. Connection of sections of the busbar shall be done using a joint kit. The connection shall be made per the manufacturer’s instructions.

J. An end cap shall be installed at the end of the busbar run.

K. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions.

L. Connections: Contractor shall make connections to supply circuits according to manufacturer's instructions and project drawings.

END OF SECTION

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 263100

PHOTOVOLTAIC SYSTEM

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. PV system description.
2. Manufactured PV units.
3. PV module framing.
4. PV array construction.
5. Inverters.
6. System overcurrent protection.
7. Mounting hardware.

1.3 DEFINITIONS

A. CEC: California Energy Commission.

B. ETFE: Ethylene tetrafluoroethylene.

C. FEP: Fluorinated ethylene propylene.

D. IP Code: Required ingress protection to comply with IEC 60529.

E. MPPT: Maximum power point tracking.

F. PTC: PVUSA Test Condition. Commonly regarded as a "real-world" measure of PV output. See below for definition of "PVUSA."

G. PV: Photovoltaic.

H. PVUSA: Photovoltaics for Utility Systems Applications.

I. STC: Standard Test Conditions defined in IEC 61215.

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 PV panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For PV modules.

1. Include plans, elevations, sections, and mounting 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.
4. Include diagrams for power, signal, and control wiring.

C. Shop Drawings for Central Hudson Gas and Electric.

1. Provide plans and equipment cuts for PV modules, inverters, and revenue meter for review and approval by Central Hudson Gas and Electric.
2. Provide 3-Line diagrams of proposed system to Central Hudson Gas and Electric for review and approval.
3. Interconnection details, including interconnection wiring diagrams with Microgrid Controller.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special materials and workmanship warranty and minimum power output warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For PV modules to include in operation and maintenance manuals.

B. I-V Curve Tracing of solar array.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of PV modules that fail in materials or workmanship within specified warranty period.

1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:

a. Faulty operation of PV modules.

b. Inverters
c. Rapid Shutdown Devices.

2. Photovoltaic Modules Warranty Period: Minimum 12 year product and 30 year performance (minimum 84.95% nominal power at 30 years).

3. Inverter Warranty Period: 20 years

B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace components of PV modules that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.

1.8 CENTRAL HUDSON GAS AND ELECTRIC APPLICATION

A. Contractor shall obtain and complete application for PV system integration (Net Metering). Contractor shall not proceed with PV system installation without written approval from Central Hudson Gas and Electric.

1.9 EQUIPMENT MANUFACTURING STANDARDS:

A. Provide equipment listed under the following standards:

1. IEC: International Electrotechnical Commission

2. UL: Underwriters Laboratories

3. NFPA:

PART 2 PRODUCTS

A. Basis of Design Photovoltaic Modules:

B. Hanwha Q CELLS – Q.Peak Duo XL-G10.3 / BFG 470W

2.2 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.

2.3 PV MODULE CAPACITIES AND CHARACTERISTICS

A. Minimum Electrical Characteristics:

1. Rated Open-Circuit Voltage: 52.91V dc.
2. Maximum System Voltage: 1000 V dc.
3. Rated Short-Circuit Current (Isc): 11.04
4. Rated Operation Current (Imp): 10.51
5. Maximum Power at STC (Pmax): 470

2.4 PV SYSTEMS DESCRIPTION

A. Interactive PV System: Collectors connected in parallel to the electrical utility; and capable of providing power for Project and supplying power to a distributed network.

1. Refer to contract drawings for array layout and kW size.
2. System Components:

a. PV modules.
b. Racking System.
c. Utility-interactive inverters.
d. Overcurrent protection, disconnect, and rapid shutdown devices.
e. Equipment Mounting structure.
f. Utility meter.
g. Transformer

h.

B. Junction Box:

1. Size: As required by NEC
2. Fully potted, vandal resistant.
3. NEMA 4X
4. Flammability Test: UL 1703.

C. Output Cabling:
1. Quick, multiconnect, polarized connectors.
2. Two-Conductor Harness: No traditional return wire is needed from the end of a row back to the source combiner.

D. Series Fuse Rating: As recommended by system provider.

2.5 PV MODULE FRAMING

A. PV laminates mounted in anodized extruded-aluminum frames.

1. Entire assembly UL listed for electrical and fire safety, according to UL 1703, and complying with IEC 61215.
2. Frame strength exceeding requirements of certifying agencies in subparagraph above..
3. Finish: Anodized aluminum.

a. Alloy and temper recommended by framing manufacturer for strength, corrosion resistance, and application of required finish.
b. Color: As indicated by manufacturer's designations.

2.6 PV ARRAY CONSTRUCTION

A. Standing metal seam roof mounting:
   1. Sanding metal seam clamps.
   2. No roof penetrations.
   3. PE Certified, ASCE-7-05 compliant, IBC 2006 compliant.

2.7 INVERTER

A. Inverter Type: Basis of Design – CPS #CPS-SCA60KTL-DO/US-480.

B. Control Type: Pulse-width-modulation control.

C. Control Type: Maximum power point tracker control.

D. Provide with integral rapid shutdown wire box and touch safe fusing

E. Enclosure: Lockable NEMA 4X

F. Integrated AC & DC disconnect switches.

G. 20 year warranty
   1. Communications Interface: RS 485, SunSpec,.
   2. Site Level Monitoring: CPS FlexOM Gateway
   3. Utility Interface: Utility-interactive inverter.

   4. Cooling Methods:
      a. Fan convection cooling.

H. Disconnects: Rated for system voltage and conductor.

I. Standing Metal Seam Metal Roof Mounting Systems:
   1. Acceptable Manufactures:
      a. Unirac – NXT Umount Rails
      b. S-5 – PVKIT HUR
      c. SnapNrack – Series 500
      d. Ace Clamp – Solar Snap
   2. Standing Seam Metal Roof Rail Clamp:
      a. Provide standing seam metal roof rail clamps manufactured from extruded aluminum that are suitable for minimum category 4 hurricane.
      b. Provide extruded aluminum solar module rail and module clamps.
      c. Provide grounding accessories as recommended by manufacture.

J. Regulatory Approvals:

   1. IEEE 1547.1.
   2. IEEE 1547.3.
   3. UL 1741.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Roof and substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prior to installation of PV system on roof, coordinate with roofing contractor for installation methods so as not to void roof warranty.

C. Do not begin installation until mounting surfaces have been properly prepared.

D. If preparation of mounting surfaces is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

E. Examine modules and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged.

F. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed, notify Engineer of unsatisfactory conditions before proceeding.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Provide close out submittal confirming solar array is functioning as designed and per manufactures specifications. Test the following parameters:
   1. Confirm all electrical connections are tight and seated correctly.
   2. Grounding system
   3. Polarity, Voltage, Power and Energy output.
   4. Confirm all protection devices, inverters, meters, monitoring system as operational per manufactures specifications.
   5. I-V Curve Tracing of solar array

C. Support PV panel assemblies independent of supports for other elements such as roof and support assemblies, enclosures, vents, pipes, and conduits. Support assembly to prevent twisting from eccentric loading.

D. Install PV inverters in locations indicated on Drawings.

E. Install weatherseal fittings and flanges where penetrate exterior elements such as walls or roofs. Seal around openings to make weathertight..

F. Wiring Method: Install cables in raceways, sized be NEC requirements, Minimum conduit size shall be ¾" unless otherwise indicated.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
H. Racking System: Install standing metal seam roof racking system per manufactures written instructions.

3.3 CONNECTIONS

A. Coordinate PV panel cabling to equipment enclosures to ensure proper connections.

B. Coordinate installation of utility-interactive meter with Central Hudson Gas and Electric.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Make splices, terminations, and taps that are suitable for the environment in which they are installed in, and shall be compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

E. At completion of installation complete following "3-Phase Solar PV Inverter-Based System Verification Test Procedure" form and submit to Central Hudson Gas and Electric.

3-Phase Solar PV Inverter-Based System Verification Test Procedure

(Procedure for 3-phase inverters)

Customer Name: _____ Customer CH Acct#: _____

Customer Address: _____

Testing Procedure Steps:

1. Make sure that the PV system is online and the breakers are closed.
2. Open the PV AC disconnect switch. Verify that the inverter(s) shut down immediately.

   O Check here to verify the inverter(s) shutdown immediately in accordance with the manufacturer's specification.

3. Close the PV AC disconnect switch and note the inverter(s) should not reconnect for at least 5 minutes.

Δ T = Time system reconnected (mm:ss) - Time AC point of disconnect is closed (mm:ss)

- Visually verify that the inverters have stopped exporting power (during this five-minute interval) by looking at the LED's on each inverter and verifying that the amber LED is lit.:
- Inverter #: 1 Δ T _____:_____ (mm:ss) Greater than 5 minutes? Circle: Yes No
- Inverter #: 2 Δ T: _____:_____ (mm:ss) Greater than 5 minutes? Circle: Yes No
- Inverter #: 3 Δ T: _____:_____ (mm:ss) Greater than 5 minutes? Circle: Yes No
- Inverter #: 4 Δ T: _____:_____ (mm:ss) Greater than 5 minutes? Circle: Yes No
- Inverter #: 5 Δ T: _____:_____ (mm:ss) Greater than 5 minutes? Circle: Yes No

4. Ensure inverter(s) shutdown immediately with loss of any leg and then verify 5 minute reconnection delay.

   Disconnect Phase A – Inverter(s) shutdown immediately? Yes / No
   Reconnect Phase A – Verify inverter(s) did not reconnect for at least 5 minutes.

   Disconnect Phase B – Inverter(s) shutdown immediately? Yes / No
   Reconnect Phase B – Verify inverter(s) did not reconnect for at least 5 minutes.

   Disconnect Phase C – Inverter(s) shutdown immediately? Yes / No
   Reconnect Phase C – Verify inverter(s) did not reconnect for at least 5 minutes.

Test Completed By:

Company Name _____ Date Test Performed _____

Name_____ Weather Conditions _____

Signature _____

END OF SECTION 263100

SECTION 263214

PACKAGE ENGINE GENERATOR SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of a stand by power Package Engine Generator System as shown of the drawings, and/or as specified herein.

1.3 QUALITY CONTROL

A. Manufacturer Qualifications: The manufacturer shall maintain a service center capable of providing training, parts, and emergency maintenance and repairs at the project site with 4 hours' maximum response time.

B. Listing and Labeling: Provide system components of types and ratings for which listing or labeling service is established and components specified in this section that are listed and labeled.

C. All Generator Sets shall conform to the requirements of:

1. NFPA 70, National Electrical Code.
2. NFPA 110.
3. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

1.4 WARRANTY

A. Submit a written warranty signed by the Contractor and the Manufacturer, with single-source responsibility for engine generator and auxiliary components, agreeing to repair or replace items that do not meet requirements or that deteriorate within the specified warranty period.

B. The warranty period shall be 5 years from the date of substantial completion.

1.5 MAINTENANCE SERVICE

A. Beginning at substantial completion, provide 12 months' full maintenance by skilled employees of the manufacturer's designated service organization. Include quarterly exercising to check for proper, starting, load transfer, and running under load. Include routine preventative maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies as used in the manufacture and installation of original equipment.

1.6 SUBMITTALS

A. Generator Set: Submissions for approval shall demonstrate compliance with every item of these specifications. Submission for approval shall include the following:

1. Complete certified catalog information for all components, including lubrication oil cooler, radiator, transfer pump and muffler.
2. Complete published output and fuel consumption data.
3. Complete outline and parts drawing of the entire engine generator set and the control panel.
4. Foundation details for mounting complete set, including vibration isolation and engine manufacturer's certification of same.
5. Schematic drawings of all auxiliary equipment on set, including but not limited to generator control panel, generator power panel, fuel pumps, fuel polishing system etc.
6. Mounting details for equipment not mounted on the set, including load bank, muffler and any other equipment required.
7. Complete schematic wiring diagrams, including the safety shut down and alarm functions, meter, indicating lights and relaying.
8. Complete report of factory testing per Part 3 of this specification.
9. Dimensioned drawings of base fuel tank and enclosure indicating locations of all accessories such as: batteries, load center, space heater, lights, switches, receptacles, thermostats, etc.
10. Interconnection diagrams of generator output circuit breaker(s) with Microgrid Controller.

B. Submission shall be based on measurements of field conditions and actual, certified dimensions of equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Engine - Generator Set

1. No provision shall be made for present or future paralleling.
2. The engine shall be capable of starting as a full compression ignition engine on diesel fuel oil at any condition within the temperature range specified below. The engine shall accelerate to rated speed and accept full load within 10 seconds maximum.

3. The generator shall be rated at 450 or 500 KW (Depending on manufacture standard ratings) – standby, 120/208V, three phase, four wire.
4. Critical Speeds: The complete engine generator set shall be free of critical speeds of either a major or minor order which would endanger or impair satisfactory operation of the set.
5. Manufacturers: Subject to compliance with the requirements. Manufacturers offering products that may be incorporated in the work are limited to the following:
   a. Caterpillar, Inc.; Engine Division
   b. Generac
   c. Kohler Company; Generator Division
   d. Onan Corporation; Industrial Business Group
   e. Spectrum / Detroit Diesel
   f. Each set shall be warranted as a complete unit by the manufacturer of the set. The warranty shall apply to every component and accessory furnished by the manufacturer of the set.
6. Rating:
   a. The engine-generator set shall be capable of producing 450./ 500 KW at 0.8 lagging power factor at 120/208 volts, 3-phase, 4-wire, 60 Hz. AC continuously (24 hours a day) without adverse effect when operating at 1800 rpm under any ambient condition from 0F to 120 F at sea level.
   b. The engine shall have a useful shaft output (all necessary power subtracted) of not less than the generator input requirement (output/certified efficiency) based on its catalogued and certified maximum horsepower, whichever is less.
7. Performance:
   a. Frequency: Upon application or removal of full-rated load in one step, the set shall recover to stabilized speed within five seconds after full-rated load is applied in one step and the frequency shall vary but not more than 5 hertz. Under steady-state conditions the maximum frequency minus the minimum frequency shall not exceed 0.25 hertz.
   b. Voltage: Under steady-state conditions, the voltage regulation shall not exceed 5 percent for any load between no load and full load, at any constant ambient temperature between minus 20 degrees F and 90 degrees F. Upon application of full-rated percent and shall recover to within the steady-state modulation band within five seconds.
8. Control Characteristics:
   a. The engine-generator set shall be capable of manual or automatic operation. The engine control circuits shall be designed for 24 Volts DC.
   b. Manual Operation: Placing the selector switch from the "OFF" to the "MANUAL" position shall cause the set to start and accelerate to governed speed. Upon reaching rated speed, the set shall be capable of accepting full-rated load. Covering the selector switch to the "OFF" position shall cause the starting circuits to open and the set to shut down.

c. Automatic Operation: With the selector switch in the "AUTO" position, the set shall start upon the removal of electrical continuity between a pair of electrical contacts provided for that purpose. The set shall be actuated through such contacts and shall have load transferred to it as specified under Automatic Transfer Switch. Upon re-energization of the normal source, load shall be removed from the set as specified under Automatic Transfer switch. The engine shall be stopped manually be means of the operation selector switch on its control panel.

d. Operation of the engine-generator set for manual testing shall be as follows:

1) The engine shall be started manually by means of the operation selector switch on its control panel.

2) When the generator is producing the percent of rated voltage specified under Automatic Transfer Switch, transfer switch shall throw to the emergency source. If load test is desired, the normal source shall be manually disconnected.

3) When the test is finished, normal power shall be restored to transfer switch and the engine shall be manually stopped after retransfer of load, as previously specified.

4) A programmable, 7-day, automatic exerciser to start the set once a week and operate it for 30 minutes under load.

9. Malfunction: During running of the engine-generator set, it shall be protected by the following malfunction circuitry:

a. Crank Failure: In the "AUTOMATIC" mode, if the engine does not accelerate to a certain required speed in 60 seconds after initiation of the start, the cranking circuit shall automatically open, the engine shall shut down, and the malfunction warning light shall come on. The start circuit shall remain open until manually reset.

b. Overspeed: Should the engine, for any reason, reach a speed of 1 percent or more above the governed speed, the set shall shut down by means independent of the governor, the main circuit breaker shall be tripped, and the warning light shall illuminate as in A. above.

c. Low Oil-Pressure: Should the lube oil pressure fall below a preset limit, the same actions shall occur.

d. High Cooling-Water Temperature: Should the jacket water temperature rise above a preset limit, the same actions shall occur.

e. Low Water Level in Radiator: Should the water level fall below a preset level, the same actions shall occur.

f. Ground Failure: Relay and wiring to terminals shall be provided to receive signal from a ground fault detector, trip the main circuit breaker, shut down the set and illuminate the malfunction light. A small pilot light at this relay shall identify the malfunction. Detectors shall be at the generator, and be supplied with the generator set.

10. Control Panel: An engine-generator electronic modular control panel shall be mounted above the generator, with vibration isolators, and shall include the following controls and instrumentation (metering shall be digital):

a. AC Ammeter, ½% accuracy

b. Frequency meter

c. AC Voltmeter, ½% accuracy

d. DC Voltmeter

e. Phase selector switch

f. Coolant temperature guage
g. Main circuit breaker, with shunt trip
h. Operation selector switch - "MANUAL, OFF, AUTO" (or "OFF" and "TEST" pushbutton)
i. Panel lights
j. Indicating lights for the following:
   1) Low oil pressure
   2) High coolant temperature
   3) Overspeed
   4) Overcrank
   5) Emergency Stop
   6) Fault shutdown
   7) Fault Alarm
k. Voltage adjust rheostat (to permit adjustment of generator voltage)
l. Frequency controller
m. Speed indicator (rpm)
n. Engine running hours
o. Lube oil pressure gauge
p. Cool down timer
q. Isochronous speed controller for electronic governor (governor reset)

11. Starting System:
   a. The engine-cranking motor shall be powered by a 24 volt, heavy duty, lead-acid storage battery having sufficient capacity to crank the engine for at least 30 seconds at firing speed in the ambient temperatures specified, with capacity for starting the engine a minimum of three times. Batteries shall have an ampere-hour capacity (to a terminal voltage of 0.65 volts per cell) as recommended by the engine manufacturer. Battery shall give 100 percent of rated capacity after 200 cycles of charge and discharge.
   b. The battery installations shall include a battery rack and a battery charger of the semi-automatic, dual-rate type, with magnetic amplifier control from a Zener voltage reference for operation on 120 volt, single phase AC. Charger shall have a manual high-charging-rate switch and 24 hour timer for automatic return to float charging, DC voltmeter, DC ammeter, pilot lights for high-rate and float-charging indication and fused AC and DC circuit protection.
   c. The charger shall be controlled to produce an output within the following limitations:
      1) Voltage Range: on float - 1.35 to 1.45 volts/cell on high float - 1.5 to 1.6 volts/cell
      2) Stability: Plus or minus 0.5 percent from 0 to full nominal current with an AC input variation of plus or minus 10 percent.
   d. Housing: The battery-charger installation shall be housed in a heavy gauge steel cabinet with access door to full face dimensions of the battery compartment with full length piano hinge. Cabinet shall be designed for proper cooling for natural convection, have heated (120VAC) battery pads with thermostat for winter operation, and shall be finished as specified herein.

12. Diesel Engine:
    a. The engine shall be single-acting, full compression ignition engine. It shall have a four-stroke-cycle, direct injection of fuel into cylinder and shall be water cooled. It may be either vertical in line or V configuration.
    b. Cylinder liners: Cylinders shall be provided with replaceable full length liners.
    c. Pistons shall have four rings. If pistons are constructed of aluminum means shall be provided to prevent excessive wear at rings.
    d. The crankshaft shall be of forged steel, statically and dynamically balanced.
    e. The flywheel, ring gear and flywheel housing shall be of the appropriate SAE construction and shall be designed to fulfill the specified speed regulation and performance requirements.
    f. Fuel system shall include replaceable filters, a fuel-control unit, and engine-driven fuel pump capable of a 12 foot lift plus friction on its suction side and of producing the required discharge pressure.
    g. Fuel filters: The fuel system shall be equipped with fuel filters having replaceable elements which may be removed easily from their housing for replacing without breaking any fuel line connections or disturbing the fuel pumps or any other part of the engine. All fuel filters shall be located for convenient access.
    h. Fuel lines: Fuel lines between injection pumps and valves shall be of heavy seamless tubing and shall be designed to prevent irregularity of fuel injection.
    i. Injection pump and valves: Injection pump and injection valves shall be a type not requiring adjustment in service, and shall be capable of easy replacement by ordinary mechanics. The engine shall have a mechanical injection pump or pumps and a pressure activated injection valve for each cylinder, any one of which shall be easily removed and replaced from parts stock. The fuel injection pump or pumps shall be of the engine driven, positive action, constant stroke type, lubricated by the engine oil. A means of controlling manifold pressure shall be provided.
    j. Lubrication: The engine shall have a forced feed lubrication system. The lube oil system shall include a sump of not less than __ gallons capacity, a dipstick and a drain; the sump vent shall not require external plumbing. The lube-oil pump shall be of the gear-type, engine driven, and shall supply oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings and valve rocker mechanism, and all other internal moving contact surfaces of metal. The lubrication system shall be an integral part of the engine-reduction drive assembly, shall be air-cooled, or water cooled, but shall require no external plumbing or radiators. Effective lubricating oil filters shall be provided and so located and connected that lubricating oil is accessible, easily removed and cleaned. The engine shall have a suitable lubrication oil cooler, either air cooled or water cooled, to ensure proper performance and engine life. The submission for approval shall state size and capacity of the lube oil cooler as well as the inlet and outlet temperatures.

k. Cooling: The engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when it is delivering full rated load in an ambient temperature not to exceed 120 F. The engine exhaust manifold will be water cooled by the cooling system.
   1) Pumps: The engine shall be equipped with an engine driven, centrifugal type pump for circulating water through the engine jacket, cylinder heads and radiator.
   2) Control: The engine shall be provided with a thermostatic bypass valve placed in the jacket water outlet, between the engine and the cooling source. This valve shall maintain the jacket water temperature, as recommended by the engine manufacturer, under all load conditions. An engine mounted, thermal circulation type water heater shall be provided, with thermostat and supply circuit, to maintain engine jacket water at 90^{o} F. in an ambient temperature of 0^{o} degrees F. The heater shall be 120 volts. Heater shall be Kim Hotstart or equal, minimum 6000 watts.
   3) Radiator: The engine shall be equipped with a water to air radiator of a type and capacity recommended by the engine manufacturer, capable of cooling the engine in an ambient temperature of 110^{o}F.

l. Governor: The engine shall have an electronic governor. The governor shall be capable of maintaining a constant speed within plus or minus 1/4 percent of rated frequency under steady state conditions (including no load) and 1/2 percent of rated frequency from no load to full load.

m. Exhaust system shall comprise stainless steel flexible connections at the engine, piping, a critical grade exhaust silencer mounted within generator sound attenuated weatherproof enclosure, a vertical discharge pipe with cowl as cap flashing. The size of the exhaust piping shall be as required by the engine manufacturer.
   1) A stainless steel hose of full diameter and 18 inches long shall be attached directly to each exhaust outlet and shall be connected to the pipe connected to the muffler without stretching.
   2) Exhaust pipe shall be schedule 40 black steel and shall be suspended from the overhead construction by hangers having a capacity of 5 times the actual load.
   3) A critical grade exhaust silencer with a flanged horizontal inlet and a flanged horizontal outlet shall be suspended from the overhead construction by means of pipe hangers having a capacity of 5 times the actual load. The muffler shall have a drain valve and a terminating pipe of full diameter.

13. Generator:
    a. The generator shall be a rotating field, three-phase, four-wire, synchronous machine rated at 450 KW at 0.8 lagging power factor, 120/208 volts Y (4 wire system), 60 Hertz AC when operating at 1800 rpm, and shall be of the single bearing, drip-proof, self-ventilated, protected type. Generator shall be built to NEMA standards. Temperature rise above a 40 C ambient shall be consistent with the class of insulation used. The generator shall be coupled to the engine flywheel through a flexible steel disc. Generator shall be solidly grounded to the station bus. Ground fault protection shall be provided with sensing on the grounding connection.
    b. The exciter shall be of the brushless type, using a rotating rectifier bridge circuit. The rectifying unit shall be mounted on the generator rotor shaft and shall supply the field excitation current for the generator. The exciter shall have a capacity to provide field current for the generator at 125 percent of rated capacity and shall be capable of carrying, without injury, momentary loads of 150 percent of its rated current. Exciter shall be as manufactured by General Electric, Delco, Electric Machinery, Kato, Ideal, or equal.
    c. The voltage regulator shall be of the transistorized type, using silicon-controlled rectifiers and Zener reference diodes Rectifier shall be protected against shorting of power rectifiers. The voltage regulating rheostat shall not be on the regulator housing but shall be mounted on the generator control panel hereinafter specified and wired to the voltage regulator.
    d. Generator Characteristics
        1) Voltage adjustment range +/- 7 percent of rated voltage.
        2) Telephone influence factor (TIF) 50 (1960) weighing.
        3) Radio and TV interference- negligible.
14. Spare Parts: The following spare parts shall be delivered to the Owner's representative:
    a. 1 set of any special tools required for normal maintenance (in a neat wood case)
    b. 1 complete set of filter elements
    c. 1 set of hose, hose clamps, and fittings for fuel oil, and lubricating oil connections.
    d. 1 set of indicating light jewels
    e. 2 sets of lamps for indicating lights

B. Weatherproof enclosure

1. Enclosure shall be Level 2 Sound attenuated outdoor weatherproof insulated construction as follows:
   a. Minimum fourteen (14) gauge sheet metal construction.
   b. Rigidity wind test design equal to 100 mph.
   c. Roof load equal to 50 lbs per square foot.
   d. Rain test equal to 5 inches per hour.
   e. Floor loading of 200 lbs per square foot of equally distributed load.
   f. Motorized intake louvers.
   g. Gravity discharge louvers.
   h. Hinged and locking doors, drip edges over doors.
   i. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
2. Accessories
   a. A.C. distribution panel with 100 amp main breaker and branch breakers for all interior A.C. accessories such as water jacket heater, battery charger, battery heater pads, generator space heater, lights, receptacles, fuel polishing system, etc.
   b. Exhaust mounting, silencer to be installed within enclosure, 90 degrees elbow with rain cap, rain skirt and stainless steel flexible exhaust connector.
   c. Battery pad heaters.
   d. Portable work platform as specified on contract drawings.

C. Base Fuel Tank

1. The engine generator set shall include a base mounted fuel tank, sized to provide a minimum of 72 hours of run time at 100% load, maximum overall height of 46.2" (Tank height of 36") with rupture basin and the following features:
   a. Rupture alarm (leak detection switch)
   b. Low fuel level alarm set to 30% of tank capacity
   c. Direct reading Fuel level gauge
   d. Four point lifting
   e. Two (2) inch lockable manual fuel fill
   f. 1-1/4" normal vent with mushroom cap
   g. Emergency pressure relief vent
   h. Fuel polishing system.

D. Fuel Polishing System

1. Provide a Complete factory-assembled automatic particulate filtration, water separation and removal system to maintain the purity of Diesel Fuel (No. 2 fuel oil) held in generator skid base tank. The system shall circulate the fuel from the storage tank, through the system, removing water and particulate matter, then returning the clean dry fuel back to the storage tank.
2. The System shall exceed diesel engine manufacturer's cleanliness target of ISO 18/16/13. Water removal to less than 100 PPM.

3. The system shall separate free and emulsified water from diesel fuel with a military type micro-glass coalescer/filter and hydrophobic water separator within a stainless steel top loading housing.
4. System shall have a touch screen HMI and PLC controller that schedules system operation with alarms and sensors that automatically indicate filter conditions, presents of water in trap, and fluid leak.
5. Industrial electric control panel shall be Underwriters Laboratory 508A and CE Listed.
6. System shall be installed with supply and return piping that is exclusive to the system and independent of any other piping to or from the storage tank(s). System supply piping shall extend to contact the storage tank bottom and be designed to maintain contact with the storage tank bottom to extract even small droplets of water.
7. The filtration system shall consist of but not limited to the following components:
   a. Equipment Enclosure: NEMA Type 4 lockable, welded aluminum, powder coated, with bottom sump. Suitable for mounting on skid base fuel tank.
   b. Five stage filtration and water removal
      i. First stage particulate filtration three (3) micron spin-on type.
      ii. Second, third, and forth stage filter/coalescer within a stainless steel housing:
         a. treated cellulose particulate filter
         b. micro-glass coalescer (mil jet fuel type) similar to Fueltec Systems LLC PO Box 487 Granite Falls, NC 28630 828-212-1141 www.fueltecsystems.com FUELTEC CF4.0-UL-PLC.
         c. Hydrophilic cloth wrap.
      iii. Fifth stage water separator Teflon coated stainless steel a. Fuel circulation pump bronze 4 GPM w/pressure relief 115/230V 1PH 50/60Hz.
         b. Stainless steel separated water trap one gallon capacity w bottom drain valve
         c. Valves: supply and return valves shall be 1" ball valves, drain ½" ball valve.
         d. Sensors:
            i. Vacuum sensor transmits condition of first stage filter to HMI/PLC
            ii. Pressure sensor transmits condition of filter/coalesce to HMI/PLC.
            iii. Water sensor transmits high & low water levels in water trap.
   c. Electrical:
      1. Industrial Control Panel Underwriters Laboratory UL- 508A and CE listed.
      2. Power required: 115AC 1PH 50/60 Hz 20A.
      3. Electrical Enclosure NEMA 4X iv) Voltage: high 115AC, low 24DC.

4. Controller: HMI/PLC touch screen:
i) Programmable: date, time, tank selection, run time. ii) Display:
(a) Low water in trap
(b) Vacuum at primary filter (filter change instructions)
(c) Pressure at final filter (filter change instructions).
(d) High water in trap (drain separated water)
(e) System on
(f) Tank selected for filtration
(g) Day selected for filtration
(h) Run time selected for filtration
(i) Time of day
iii) Alarms:
(1) High water in trap
(2) High vacuum (service primary filter)
(3) High pressure (service final filters)
(4) Fluid in system sump
(5) No fluid flow
a) System Options:
i) Housing heat blanket for sub-freezing installations.
ii) Mounting post with welded base plate iii) Tank flange kit w/ 1" telescopic fuel pickup.
iv) Modbus network kit.
v) Manufacture tech. on-site 8 hrs. for inspection, startup and training of owner's personal.

PART 3 EXECUTION

3.1 EXECUTION

A. Factory Field Engineer: The services of a competent factory field engineer regularly in the employ of the manufacturer of the engine generator set or his authorized distributor (only) shall be provided for the times specified herein in connection with field testing and oral instruction (as specified herein) and also for a period of two full working days, at the required time, to supervise the installation of the generator.

B. Testing:

1. The factory and field test shall be conducted with no deviations from the Contract requirements, no electrical or mechanical additions that will not remain after acceptance, no unusual adjustments that will not be permanent and no tampering of any nature with the set.

2. The manufacturer of the engine generator set shall fully and completely test the set at the factory before shipment to assure guaranteed rated performance as follows:
   a. The following functions of the engine shall be tested for proper operation, both electrically and mechanically (alarm function to be simulated):
      1) Oil pressure and temperature shut down
      2) High jacket water temperature shut down
      3) Overspeed shut down
      4) Cranking failure shut down
      5) Low water level shut down
   b. Test sequence and recorded data shall include the following:
      1) Prior to startup, air temperature, fuel supply and running time meter reading shall be recorded. The engine shall be started and the time to achieve 90 percent of rated voltage shall be recorded.
      2) The engine shall be run at 75 percent load (at 0.8 PF) for one hour and the following data shall be recorded at the start and end of run:
         a) Jacket water temperature
         b) Exhaust gas temperature
         c) Running time meter reading
         d) Alternator speed
         e) Voltage per phase
         f) Frequency
         g) Power
         h) Amperes per phase
         i) Exciter DC field amps
         j) Fuel consumption
         k) Room temperature
      3) Voltage and frequency transients and recovery times for the set shall be recorded as load is varied in the following sequences:
         a) 50 percent load to full load
         b) Full load to no load
         c) No load to full load
         d) Full load to 50 percent load
         e) 50 percent load to no load
      4) The engine shall be run at 100 percent load for two hours, recording all data as in (2) and (3) above at 15 minute intervals.
      5) The Engineer reserves the right to witness factory testing and shall be given 10 calendar days advance notice of the commencement of such tests.
      6) The manufacturer shall submit certification that the engine generator set meets the requirements specified herein.
3. After the engine generator set has been installed, the Contractor will notify the Engineer in writing 10 calendar days prior to the commencement of the following field testing.
   a. Voltage and frequency transients and recovery times for the set shall be recorded as load is varied in the following sequences:
      1) 50 percent load to full load
      2) Full load to no load
      3) No load to full load

4) Full load to 50 percent load
5) 50 percent load to no load

4. The manufacturer's field engineer shall perform the following checks and tests on site:
   a. The field engineer shall test every function required by the Contract under the automatic (safety shut down and alarm) and manual modes of operation.
   b. The field engineer shall additionally test the operation of the governor, the voltage regulator, and all functions of the fuel system and the lubrication system of each engine.
   c. The field engineer shall adjust the governor, voltage regulator and engine firing as required.

C. Installation of Engine-Generator Set:

1. The engine-generator set shall be installed on a concrete base provided by the Contractor. Hold-down bolts and templates shall be furnished by the Generator Manufacturer for installation by the Contractor.
2. A set of spring type vibration isolation pads approved by the set manufacturer shall be provided with the generator set for installation between the concrete foundation and steel base of the unit. The set manufacturer's certification of the vibration isolation shall accompany the submission for approval. Locations of boxes and conduit stubs on plans are approximate and shall be verified to suit the approved set.

E. Conduits rising from the floor shall be connected to the set by means of flexible metallic conduit not less than 18 inches long.

F. Diesel Fuel Oil Base Tank:

1. Performance Requirements:
   a. The tank will store the specified gallonage +/-1% when filled. The tank shall be supplied with a calibration chart indicating amount of liquid in the tank at one-inch increments, for use at the end fittings or at the center fittings.
   b. The tank will not leak when tested to a pressure of 10 inches of mercury 5 (psi).
2. Marking and Identification:
   a. The tank shall be marked on one end with the manufacturer's name and/or logo. In addition the information concerning test pressure, installation and safety precautions shall be stenciled on tank.
   b. An Underwriter's Laboratories Label (Series NO. 142) shall be adhered to the tank.
   c. A Factory Mutual Approval Label shall be adhered to each tank.
3. The Contractor shall fill diesel fuel oil with the tank for testing of equipment. After testing has been completed, the Contractor shall provide additional diesel fuel oil to fill the base fuel tank; All fuel shall be minimum 30% kerosene.

G. Fuel Piping:

1. Piping shall be schedule 40 black steel pipe with 125 pound cast-iron fittings, except vent pipe which shall be galvanized with galvanized fittings. Piping shall be painted.
2. Unions in screwed pipe lines shall be 250 psi, WWP, malleable iron with extra heavy, bronze ground joints.
3. Foot valve shall be of the double pattern and shall be as manufactured by Buckeye, or equal.
4. Flexible connections: Piping shall be connected to engines by means of corrugated stainless steel flexible hose armored by braid of the same material and terminating in connectors rated as specified for fittings. Hose shall be not less than 18 inches long and shall be American, or equal.
5. Pipe hangers and supports shall conform to the requirements of the Standard Practice SP-58 of the Manufacturer's Standardization Society of the Valve and Fittings Industry.
6. Fill pipe shall have a lockable, flush fill cap where indicated.
7. During construction all lines shall be capped to prevent the entrance of foreign matter.
8. Fuel Oil Piping: All fuel oil piping shall be tested, before connection to tanks, to a pressure of 100 psi with compressed air for a period of four hours to detect all leaks and defects. Leaks in piping joints shall be corrected by remaking the joints. Caulking will not be permitted.

END OF SECTION 260621

SECTION 263317

BATTERY ENERGY STORAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. This specification describes a Battery Energy Storage System (BESS) comprised of an electrochemical-type lithium-ion, containerized battery energy storage system which includes the batteries, power conversion system (PCS), fire prevention and suppression, HVAC, BESS unit controller, and enclosure hereinafter referred to as the BESS.

1.2 DEFINITIONS

A. BESS – Battery Energy Storage System

B. BMS – Battery Management System

C. C Rate – Rate of Battery Charge or Discharge

D. DAS – Data Acquisition System

E. DOD – Depth of Discharge

F. EMS – Energy Management System

G. FACP – Fire Alarm Control Panel

H. HMI – Human Machine Interface

I. ISO - Independent System Operator

J. LFP – Lithium-Iron Phosphate

K. PCC – Point of Common Connection

L. PCS – Power Conversion System

M. SBE – Stationary Battery Energy

N. SMPS – Switched-Mode Power Supply

O. SOC – State of Charge

P. SOH - State of Health

Q. UPS – Uninterruptible Power Supply

R. VPN – Virtual Private Network

S. WAN – Wide Area Network.

T. Utility – Central Hudson Gas & Electric

1.3 CODES AND REFERENCES

The design and installation shall conform to all the requirements as defined by the applicable codes, laws, rules, regulations, and standards of code enforcing authorities (latest edition unless otherwise noted). The following are the key standards that shall be followed. The Engineer or Architect of Record and the Contractor shall ensure all codes are followed.

A. ASTM International (ASTM) (www.astm.org)

B. American National Standards Institute (ANSI), including:
   1. ANSI C37, Surge Withstand Capabilities
   2. ANSI C57, Transformer Standards

C. Institute of Electrical and Electronics Engineers (IEEE), including:
   1. IEEE 693, Recommended Practices for Seismic Design and Substations
   2. IEEE 1375, Guide for Protection of Stationary Battery Systems
   3. IEEE 1491, Guide for Selection and Use of BMS
   4. IEEE 1547-2018, Standard for Interconnecting Distributed Resources with Electrical Power Systems
   5. IEEE 2030.7-9, Microgrid Controller Standards

D. International Electrotechnical Commission (IEC), including:
   1. IEC 62897, Stationary Energy Storage Systems with Lithium Batteries

E. International Electrical Testing Association (NETA)

F. International Fire Code:
   1. CFC 1207-2023, California Fire Code

G. Local Fire Jurisdiction Requirements

H. National Electrical Manufacturers Association (NEMA)

I. National Fire Protection Association (NFPA), including:
   1. NFPA 70, National Electrical Code
   2. NFPA 704, Standard System for the Identification of Hazards of Materials for Emergency Response
   3. NFPA 855, Standard for the Installation of Stationary Energy Storage Systems

J. Owner Specification Requirements

K. Underwriters Laboratory (UL), including:
   1. UL 1642, Standard for Lithium Batteries
   2. UL 1741/1741-SA/1741-SB, Standard for PCSs, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Systems

3. UL 1973, Standard for Batteries for Use in Stationary Applications
4. UL 9540 Edition 2, Standard for Energy Storage Systems and Equipment
5. UL 9540a, Standard for Thermal Runaway Fire Propagation in Battery Energy Storage Systems
6. UL 2900, Standard for Software Cybersecurity for Network-Connectable Products
7. UN 38.3, Transportation Testing for Lithium Batteries and Cells

L. Local utility company standards and requirements

M. All other applicable Codes and Ordinances

1.4 SYSTEM OPERATION

A. Normal Operating Condition:

1. BESS shall operate in parallel with normal power utility feed.

2. BESS shall operate in parallel with photovoltaic system.

3. BESS unit to assist in reduction of utility demand charges.

B. Loss of Utility Power:

1. BESS shall operate in parallel with emergency generator, when normal power utility feed is not available.

2. Provide feeder protection relay similar to Schweitzer Engineering Laboratories #SEL-751 (Note: Obtain approval for this type of relay from Central Hudson Gas and Electric Co.) to detect reverse power / loss of utility.

3. Generator start signal is sent.

4. 1000amp branch breaker in MDS serving switchboard MDP2 Opens to Island switchboard MDP2.

5. Both 2000amp main breakers in MDS open.

6. 2000amp tie breaker in MDS closes.

7. 2000amp normally open breaker in MDS (feed from generator via manual transfer switch) closes.

8. BESS unit transitions to or restarts in grid forming mode.

9. PV system returns on-line in island mode and parallels with BESS unit.

11. PV systems goes off-line to allow for BESS unit to transition to operating in Island mode

12. IF V and F good at generator, 2000amp gen output breaker closes, restoring power to MDS.

13. Sync gen to MDP2 and transition to fully islanded microgrid mode.

14. Gen stays in isochronous mode.

15. Synchronize MDS to MDP2, close 1000 amp breaker in MDS feeding MDS2.

16. BESS immediately transitions to grid-following.

17. Microgrid controller enforces minimum forward power out of generator by limiting PV power output if necessary.

18. Microgrid controller charges BESS opportunistically from PV.

19. Microgrid controller manages PV as required.

C. Loss of Generator Power:

1. 2000amp normally open breaker in MDS (feed from generator via manual transfer switch) opens.

2. Generator 2000amp output breaker opens.

3. 1000amp breaker in MDS, serving MDP2 opens.

3. Microgrid controller maintains BESS unit and PV in operation.

D. BESS shall be provided with system software to monitor:

1. Frequency and voltage from utility company.

2. Revenue Generation – Control peak shaving, renewable coupling,

3. Maintenance – Monitor battery health, balance load among battery banks, provide reminders for system maintenance.

1.5 INFORMATIONAL SUBMITTALS

A. Performance and technical specifications for the following BESS components shall be provided:
1. PCS(s)
2. Fire suppression system.
3. Battery enclosure
4. Monitoring and control components
5. Battery management system(s)
6. HVAC system

B. Interconnection diagrams with utility service, generator and photovoltaic power systems via Microgrid Controller.

C. Interconnection application to Central Hudson Gas and Electric, including all protective relaying and OCPD catalog cut sheets.

D. Start-up and Commissioning

E. Installation manual(s)

F. Wiring requirements for BESS package

G. Drawing package

H. Factory Acceptance Testing shall be performed, and documentation provided for validation of the following performance criteria:
   1. Interior and exterior visual inspection
   2. Usable Energy capacity and cycling test.
   3. Thermal imaging to verify the integrity of all connections.
   4. Round trip efficiency performance measurement data, based on specific system configuration.
   5. Power factor test
   6. Rated continuous power test.
   7. Communications operations check.
   8. Operations check:
      a. Grid-to-island transition.
      b. Island-to-grid transition
      c. Black start
      d. Emergency-stop shutdown
      e. Maintenance shutdown
      f. Low SOC stop.
   9. Emergency response sequence:
      a. System shutdown on abnormal operation
      b. Fire suppression.
      c. Automated notification via controller

I. Manufacturer to provide techno-economic modeling services, upon request, to evaluate project feasibility and advice on various state and local incentive programs:
   1. Utility Demand Response Incentive(s)
   2. Federal and State Driven Capital Expense Incentive(s)/Tax Credit(s)
   3. Ongoing State Solar Production, Export, Storage Incentive(s)
   4. BESS/generator/PV sizing analysis
   5. NYSERDA

J. Shop Drawings for Central Hudson Gas and Electric.
   1. Provide plans and equipment cuts for BESS Unit for review and approval by Central Hudson Gas and Electric.
   2. Provide 3-Line diagrams of proposed system to Central Hudson Gas and Electric for review and approval.
   3. Interconnection details, including interconnection wiring diagrams with Microgrid Controller.

1.6 CLOSEOUT SUBMITTALS

A. Operations and Maintenance Data: Packaged BESS to include emergency procedures, safety precautions, fire suppression procedures, operation, and maintenance manual(s). Include the manufacturer's recommended maintenance and periodic testing plan in accordance with NFPA 855, Chapter 7.

B. Furnish extra materials defined in project documentation that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

A. The BESS manufacturer shall maintain a call center for technical and emergency support for the battery system described in this document.

B. The BESS manufacturer supporting this battery system shall directly employ a field service department staffed by factory-trained field service engineers dedicated to support startup, maintenance, and repair of BESS and related equipment.

C. Parts supplies shall be available to provide emergency needs in a timely fashion, based on field population.

D. Preventative and corrective maintenance contracts shall be offered with the proposal. Contracts should only be accepted if factory-certified personnel perform all the preventative and corrective maintenance on the BESS system.

1.8 MATERIALS, DELIVERY, STORAGE, AND HANDLING

A. The BESS system described in Part 2 of this document shall be delivered as a single container package. Packages that require any assembly of subsystem components at the project location will not be accepted.

B. All materials shall be delivered new, undamaged, and without defects.

C. All materials shall be stored in a manner consistent with the manufacturer's recommendations.

D. All equipment shall be installed in a new and neat condition.

E. Appropriate protective clothing shall be worn when handling the equipment.

1.9 WARRANTY

A. Manufacturer's Warranty: The manufacturer agrees to repair or replace components of packaged BESS and associated auxiliary components that fail in materials or workmanship within the specified warranty period.
   1. System Warranty Period: **Ten (10)** years from the date of Owner Acceptance.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Manufacturers shall provide equipment that meets standards and performance criteria set forth in the design documents and Contract.

A. Subject to compliance with requirements, the BESS shall have a minimum rated output of 125kW, an initial usable energy capacity of 500kWh, at 208 VAC (Should unit output be 480 VAC then provide an external transformer, to deliver 208 VAC, three phase, four wire, 60Hz while operating at minimum and maximum ambient temperature range of -13 to 113 Deg. F without reduction in the performance criteria described in this document.

Additional Acceptable Manufactures (Subject to meeting the requirements of contract documents).

1. Cadenza
2. Caterpillar
3. Generac
4. Engineer Approved Equal

Any BESS provided as DC-rated capacity without providing the usable capacity at the PCS output terminals listed in 2.1.A will not be accepted.

B. The BESS shall be provided with a micro-grid controller, which is capable of monitoring and managing each utility electrical service, stand-by generator, and roof mounted photovoltaic (PV) array. Should there be a loss of both utility electrical services the BESS will provide and manage a micro-grid to allow for parallel operation of stand-by generator, PV array, BESS and server room UPS.

2.2 EQUIPMENT AND MATERIALS FOR PROPOSAL

A. The BESS System(s) shall meet the following minimum requirements:

1. The battery shall be electrochemical and be of LFP technology.
   a. Lithium-iron Phosphate (LFP, LiFePO4) Battery Energy Storage System (BESS)
   b. Lithium Nickel Manganese Cobalt (Li-NMC) battery chemistry will not be accepted.

2. The battery shall be from a proven technology designed for the type of service described by this specification and the design documents. For this specification's purposes, proven technology shall be defined as having been in successful commercial service in similar applications.

3. Efficiency shall be:
   a. Minimum 85% AC round trip system efficiency.
   b. The usable energy storage capacity after 10 years shall be a minimum of 79% at a 1C rate or 80% at <1C rate, assuming one cycle per day at 100% depth of discharge of usable energy capacity with an operating temperature of 25C +/- 5C through 10 years of service. The 10 years will be measured from the time of commissioning or one month after arriving onsite, whichever occurs sooner. Meeting this requirement with augmentation shall not be accepted.

2.3 BATTERY ENCLOSURE STANDARD FEATURES

The battery enclosure shall consist of the following standard components, housed in a single metal frame enclosure. Each enclosure contains bi-directional energy storage, a Power Conversion System (PCS), monitoring and control components, an HVAC system, a fire detection system, and a fire suppression system.

A. Battery Enclosure Input Sources and Capabilities:
   1. Battery C-Rate: Up to 1C
   2. DC Voltage Range: 710VDC to 1,475VDC
   3. Ambient Temperature: -25C to 45C (-13F to 113F)
   4. Operating Elevation before Derate: minimum 3280ft (1000m)
   5. Nominal AC Voltage: 480VAC
   6. Frequency Rating: 60Hz
   7. AC configuration: 3-wire (3P3W)

B. The Bi-Directional Energy Storage and PCS shall provide the following capabilities:
   1. PCS shall be integrated as part of the BESS system and shall be housed internal to the enclosure.
   2. PCS shall have the rated power output listed in 2.01.A.
   3. The PCS shall be provided with the following features:
      a. Grid tie (Utility Interactive)
         1) Frequency Compensation Mode (F-mode)
         2) Volt-VAr Compensation Mode (E-mode)
         3) PQ Mode (Grid Tied Operation)
      b. Off-grid
         1) UF Mode (Islanded Operation, Microgrid Mode, and Isochronous)
      c. Power Factor: Unity; Full 4-quadrant
      d. THD <2%
      e. Overload capacity: 110%, 10 minutes or 125%, 10 seconds
      f. Peak Efficiency: Up to 98.4%

   4. Electrical: The following ratings shall be met at the minimum battery voltage:
      a. Rated Output Apparent Power: Capable of supporting power listed in 2.01.A.
      b. Rated Output Real Power: Capable of supporting power listed in 2.01.A.

   5. Software Protections: The BESS shall have the following programmable protections available:
      a. The PCS shall be capable of "Normal", "Ride-through", "Momentary cessation", and "Trip" operations in accordance with IEEE 1547-2018.

   6. Inverter/PCS Protections:
      a. AC Circuit Breaker Ampacity:
         1) Manually operated AC Circuit breaker
         2) Surge protection included and monitored.
         3) Manually operated fused DC disconnect switch
         4) Remote & local E-stop capabilities

C. Monitoring and Control Components

The following components shall provide monitor and control capabilities:

1. The BESS unit controller is a combination of software and hardware for providing integrated controls and monitoring of the BESS, including battery racks, PCS, and associated ancillary equipment. The BESS unit controller shall be capable of interfacing with higher-level controllers (e.g., microgrid controller or site controller) and provide an interface for remote control and monitoring of the BESS through Ethernet connections. The BESS unit controller shall manage the operation of individual containers with a fully functional HMI. A separate site-level or microgrid controller shall be responsible for managing a cluster of BESS containers and other onsite energy assets as a collective system. The BESS unit controller interface shall be able to communicate all Modbus points available within the BMS and the system PCS(s).

2. The BESS unit controller shall be capable of the following protective features:
   a. Power limits: The BESS unit controller will limit the power output of the BESS depending on the battery rack conditions and the number of battery racks available in the system. These limits are reflected in the Max Charge Power and Max Discharge Power registers.
   b. SOC Limits: The BESS unit controller shall protect against deep discharge and overcharge conditions and will curtail the power capability of the system. If the SOC threshold for Max Charge Power or Max Discharge Power is reached, the BES**S** unit controller shall report a "zero" capability to charge or discharge, respectively. Additionally, to protect the batteries against permanent damage, the batteries will be tripped off if the SOC reaches critical low or critical high limits. The SOC limits shall be programmable and set to the following:
      1) Critical Low Limits: 2%
      2) Low Limit: 5%
      3) High Limit: 95%
      4) Critical High Limit: 98%
   c. Frequency and Voltage Limits: The BESS shall be capable of operating in islanded mode or grid-connected mode for frequency and voltage protection. Under normal conditions, while in automatic mode, and with the PCC breaker closed, the controller shall automatically switch between the two modes.

3. The BESS unit controller HMI shall be capable of the following:
   a. Provide detailed monitoring of the BESS and its internal parameters for operation.
   b. Provide 60-gigabytes of usable storage for data accumulation and HMI files.
   c. Capable of expanded features to host a database along with appropriate licenses for data accumulation and archiving.
   d. Capable of transferring data through an internet connection for long-term archiving.
   e. Capable of expanding the local storage and archiving beyond 60-gigabytes.

4. Cyber Security:
   The BESS shall be protected against cybersecurity threats at multiple levels using the following forms of Gateway-to-Data Services (Cloud) Communication Security:
   a. Protocol: AMQP or MQTT should be used for all Gateway-to-Data Services (Cloud) communication.
   b. Transport security: Transport Layer Security (TLS) connection for all data transactions.

c. Network security: The primary Gateway-to-Data Services (Cloud) connection shall be via cellular service. The gateway shall support a customer's ethernet connection as well. For cellular, the gateway shall utilize a cellular private network implementation for delivering a secure connection between the gateway and Data Services (Cloud) layer, in addition to the communication infrastructure security built within the platform.

d. Authentication: The authentication for Gateway-to-Data Services (Cloud) communication shall be managed by a combination of the device ID (gateway serial number) and unique IoT (Internet of Things) Hub shared secret key per gateway, generated and provided, by the Gateway Authorization Vault during the registration/re-registration process. Keys are regularly regenerated and rotated for security.

e. Internal Service Calls shall be secured with service-to-service credentials. No global credentials exist within the hosting environment to provide independent connection security for all service boundaries.

5. BESS Unit Controller Functions: Functions can be divided into two main categories, Grid-Connected and Islanded:

a. Grid Connected: In grid connected state, the controller dispatches the BESS to achieve the following (4) objectives:

1) Import Limit Assist Functions: If the PCC active power flow exceeds the import limit/demand limit, the BESS will begin to discharge to support the active demand.

2) Export/Minimum import limit assist function: If the PCC active power flow reaches the minimum import limit/export limit, the BESS will begin to charge using any available source at the PCC.

3) Time of Use (TOU) energy spread function: This function allows the BESS to charge, and discharge, based on the TOU Energy Spread Function being active, the BESS unit controller shall also support the Import Limit Assist Function and the Export/Minimum Import Limit Assist Function.

4) Power factor correction function: This function allows dispatch of the reactive power of the BESS to achieve a fixed power factor across the PCC. The controller shall dispatch the BESS to sink or source reactive power to bring the PCC power factor to the power factor setpoint. The BESS unit controller shall prioritize active real power over reactive power to avoid exceeding the BESS kVA capability.

b. Islanded: While the islanded function is active, the BESS shall operate in grid-forming mode with the droop function enabled. Also, while the islanded function is active, the BESS unit controller shall be capable of the following parameters for power sharing:

1) Desire Setpoint: If the BESS is not required to provide any assistance (or if in manual mode), the BESS will be dispatched at the desired set point.

2) High Sharing Limit: If the BESS is to assist in an objective, then the controller caps the dispatch of the BESS at this limit.

3) Low Sharing Limit: If the BESS is to assist in an objective, then the controller caps the dispatch of the BESS at this limit.

D. Battery Management Systems (BMS): Each enclosure shall contain a battery management system, which has the following features and components:

1. Cell: The cells shall have up to 1C charge and discharge capability.
2. Module: The modules shall have a minimum energy capacity of 15kWh nameplate rating.

3. Rack: A group of modules and control boxes are connected in series through electrical connectors, delivering system-level voltage.
4. The Battery Management System (BMS) shall include an isolation and protection system for each rack, which integrates a rack controller, a high voltage management unit, circuit breakers, main contactors, pre-charge resistors, fuses, current sensors, and switching power supply.
5. Battery Management System (BMS): The BESS shall include a collection of electronic devices used to monitor, evaluate, and protect battery operating conditions. It consists of Battery Module Controllers, Battery Rack Controllers, a Battery System Controller, a BESS Unit Controller, HMI, and other components. It has three levels and enables monitoring and transmitting operational status information of battery cells, battery modules, and battery racks. Parameters monitored shall include at a minimum: battery voltage, current, temperature, protection status, evaluating and calculating the state of charge (SOC), state of health (SOH), and calculating accumulated energy into and out of the battery for the purpose of protecting the battery safety.
    a. Battery System Controller: Responsible for managing multiple sets of battery racks, communicating, sending, and receiving commands with other internal devices such as the BESS Unit Controller, PCS, and HMI.
    b. Battery Rack Controllers: Responsible for the management and communication with multiple battery modules within a series string (rack). It is also responsible for collecting information, alarming, and protecting in case of overvoltage, undervoltage, overcurrent, short circuit, or unsafe temperatures of the battery string (rack). The collected information is summarized and sent to the upper-level Battery System Controller to ensure the safe, reliable, and efficient operation of the system.
    c. Battery Module Controllers: Responsible for cell voltage and temperature acquisition, balancing management, real-time cell monitoring, and upward communications.
        1) The battery Module Controllers shall incorporate active cell balancing technology.

2.4 FIRE PREVENTATIVE AND DETECTION SYSTEM

A. Fire Mitigation/Safety:
1. Fire detection and suppression system(s) for BESS shall comply with NFPA 855.
    a. The BESS shall be protected by an approved continuous gas detection system.
2. The BESS system shall include a fire detection system integrated as part of the BESS package with the following features:
    a. A six-zone Fire Alarm Control Panel (FACP) for single and dual hazard agent releasing devices with the following features:
        1) External audible alarm
        2) External visual indicator (Strobe or LED)
        3) Temperature sensing
        4) Smoke Detection
        5) LED Indication of the following criteria:
            a) Fire Alarm
            b) Supervisory
            c) Trouble
            d) AC Power
            e) Discharge
            f) Pre-discharge

g) Abort

6) Control Button Functions:
   a) Acknowledge
   b) Alarm silence
   c) Drill
   d) System rest (lamp test)
   e) Remote E-stop
7) Programming and Software Capabilities
   a) Programmable abort operations
   b) Three programmable Form-C relay outputs
   c) Pre-programmed and custom application templates
   d) Continuous fire protection during online programming at the front panel
   e) Program checks to automatically catch common errors not linked to any zone or input point.
8) User Interface Capabilities
   a) Integral 80-character LCD display with backlighting
   b) Real-time clock/calendar with automatic daylight savings adjustments
   c) ANN-Bus for connection to remote annunciators
   d) Audible horn to alert of alarm, trouble, and supervisory statuses
9) Annunciator Capability
   a) Capable of supporting up to (8) remote annunciators

3. Lithium-Ion Off-Gas Detection System:
   a. The off-gas detection system shall stop battery charging if battery cell venting is detected.

2.5 FIRE SUPPRESSION SYSTEM (If Required by Manufacture)

A. The BESS shall comply with NFPA 855

B. The fire suppression system shall be an Electrically Operated Fire Suppression System with the following features as noted on the project drawings:
   1. Dry solutions suppression
   2. Overhead sprinkler
   3. Dry standpipe connections
   4. Motorized Louvers as part of the HVAC system
   5. Deflagration panels (if required by Authority Having Jurisdiction)

2.6 HVAC SYSTEM

A. The HVAC system shall be capable of maintaining enclosure ambient temperature between 70-80F when ambient temperatures are within BESS operating temperatures that are listed in this document.

B. The HVAC system shall have the capability to exhaust any flammable gases evolved, maintaining gas levels below 25% of the Lower Flammable Limit (LFL) in compliance with NFPA 855 9.6.5.1.5.4.

C. The HVAC Controller shall be connected to the Battery System Controller such that abnormal battery conditions will activate exhaust ventilation.

2.7 MECHANICAL DESIGN

A. Enclosure:
   1. The battery rack frame and base shall be steel construction and contain all the required system components as a single package.
   2. Access doors shall be capable of being equipped with locks to prevent unauthorized entry. Door access shall trigger an alarm to all HMI equipment when the door is open.
   3. For outdoor installations, the enclosure shall be outdoor rated: NEMA 3R.
   4. The enclosure shall be drip-proof.
   5. The enclosure shall include lifting provisions.
   6. Maximum sound output at 1 meter: 65dB.

B. Enclosure Color: Manufacturer's standard color.

C. Cable entry: Standard cable entry for the battery enclosure shall be through the bottom of the enclosure.

D. Front and side access: All serviceable subassemblies shall be modular and capable of being replaced from the front and sides of the enclosure.
   1. Comply with NFPA 70 and NFPA 855.

2.8 REMOTE MONITORING

A. The BESS shall have the following remote monitoring capability:
   1. Compatibility with a remote monitoring platform. The platform is intended to be cloud-based, supporting various methods of equipment connectivity by edge controllers, and compatible with any make, model, and vintage of equipment. The platform should be extensible to support monitoring of other commands, email and text message alarm notifications, unlimited user accounts, an option for a dedicated hosting environment, and an API for retrieving data and sending control commands.
   2. Able to integrate into industry standard Building Management System(s) and/or Network Management System(s).
   3. Modbus TCP protocol communication capabilities will be available for all systems.

2.9 MISCELLANEOUS REQUIREMENTS

A. Paralleling Capabilities:
   1. The BESS shall be capable of paralleling with utility company electrical feeds, roof mounted photovoltaic system and stand-by generator.
   2. The BESS shall be capable of paralleling with additional BESS containers of the same manufacturer or other onsite energy assets for redundancy, power, and/or energy enhancements.

B. Equipment:
   1. BESS supplier shall provide an appropriately sized isolation transformer to provide isolation and grounding as required by the local utility interconnect requirements.
   2. Revenue grade metering shall be provided to evaluate bidirectional power flow.
      a. AccuEnergy or equal.
   3. For sites involving multiple onsite distributed energy resources, a site/microgrid controller shall be provided for the purposes of integrating other onsite energy assets as a single point of communication with the following features as a minimum:
      a. Capable of data collection and visualization, alarm handling, operation, and maintenance.
      b. Remote Communications capabilities shall include Ethernet and Cellular.
      c. The external communication interface shall include Modbus RS485, Modbus TCP, DNP3, and API.
   4. Utility-grade protective relays shall be provided per local utility requirements.
      a. SEL-751 or equal
   5. Switchgear.
      a. See separate switchgear specification for requirements of Distributed Energy Resource (DER) AC Collector bus.

PART 3 EXECUTION

The execution responsibility is within the scope of the installer. BESS manufacturer shall support the installer with all required information on equipment as required.

3.1 UTILITY INTERCONNECT AND PERMITTING

A. The contractor shall coordinate with the local utility company to provide all grid intertie requirements and process all required paperwork per utility company requirements.

B. Ensure that all permitting is closed out with the Authorities Having Jurisdiction.

3.2 EXAMINATION

A. The contractor is to examine areas, equipment bases, and conditions, with the installer present, for compliance with requirements for installation and other conditions affecting packaged BESS performance.

B. The contractor is to examine rough-in for piping systems and electrical connections. Verify actual locations of connections before packaged BESS installation.

C. The contractor is to proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Coordinate with the Central Hudson Gas & Electric, Engineer, construction manager, and owner to process all grid intertie requirements per the local utility company's requirements and coordinate any interruption of electrical service during execution.

B. Manage the local utility company interconnection process and ensure that the systems achieve Permission to Operate (PTO).

3.4 INSTALLATION

A. Install in accordance with the manufacturer's instructions, observing applicable building and fire codes.

B. Comply with the following NECA standards:
1. NEIC 1 – Standard for good Workmanship in Electrical Construction
2. NEIC 416 – Recommended Practice for Installing Energy Storage Systems (ESS)
3. NEIC 90 – Standard for Commissioning Building Electrical Systems
4. NEIC 417 – Recommended Practices for Designing, Installing, Operating, and Maintaining Microgrids
5. NECA 411-2006 – Standard for Installing and Maintaining Uninterruptable Power Supplies (UPS)

C. Equipment Mounting:
1. Coordinate size and location of concrete base(s) for packaged BESS. Cast anchor-bolt inserts into base(s). Concrete reinforcement and framework requirements are specified with concrete.

D. Install packaged BESS to provide access, without removing connections or accessories, for periodic maintenance.

3.5 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems".

B. Provide a minimum of one 90-degree bend in flexible conduit routed to the BESS(es) from a stationary element.

3.6 COMMISSIONING

A. Start-up service shall be provided and shall include one visit to perform all procedures and tests specified within the battery system Installation and Operation manual. BESS manufacturer's certified representative shall also offer the following optional services:
1. Pre-energize visit to inspect the installation and provide guidance to installers as required.
2. A post-start-up visit for alarm notification configuration, operator training, BESS testing, etc.

B. The following procedures and tests shall be performed by a manufacturer-certified representative during the battery system start-up:
   1. Visual Inspection:
      a. Visually inspect all equipment for signs of damage or foreign materials.
      b. Observe the type of ventilation, the cleanliness of the site, the use of proper signs, and any other safety-related factors.
   2. Mechanical Inspection:
      a. Check all the power connections for proper torque tightness.
      b. Check all the control wiring terminations and plugs for torque and proper seating.
   3. Electrical Pre-check:
      a. Verify all power and control wiring connections are secure.
   4. Initial battery system startup:
      a. Configure battery enclosures and system using Service software.
      b. Verify that all the alarms are in a "go" condition.
      c. Wake up the BESS module and verify proper communications.
      d. Check the battery string voltage.
      e. Optional on-site battery discharge tests using supplier furnished load bank(s) shall also be offered.
   5. Operational Training:
      a. Before leaving the site, the field service engineer shall familiarize the personnel responsible for the operation of the battery system. The BESS equipment shall be available for a demonstration of the modes of operation.

C. Coordination
   1. Coordinate with tests for transfer switches and run them concurrently.

D. Operational Test
   1. After electrical circuitry has been energized, start units to confirm proper phase rotation and unit operation for the BESS and associated equipment.

E. Adjustments
   1. Test and adjust the controls and safety settings.
   2. Replace damaged and malfunctioning controls and equipment.

F. Repairs
   1. Remove and replace malfunctioning components; retest and reinspect as specified above.

G. Retest
   1. Once corrections to deficiencies identified by tests and observations are complete, retest the system until specified requirements are met.

H. Reporting
   1. Report results of tests and inspections in writing.
   2. Record adjustable relay settings and measure insulation resistances, time delays, and other values and observations.

3.7 REPAIR AND PREVENTATIVE MAINTENANCE SERVICE

A. Repair and Service Capabilities:
   1. The BESS supplier shall maintain service parts inventory for the BESS system. The manufacturer of the BESS shall maintain a central parts inventory to support the supplier with all the major components of the BESS system.
   2. The BESS shall be serviced by a local service organization trained and factory-certified in BESS service. The supplier shall maintain an inventory of replacement parts. An authorized service organization and service personnel shall be physically located within 100 miles of the site.
   3. The manufacturer shall maintain model and serial number records of each BESS provided for at least 20 years.

B. Preventative Maintenance Service Agreement:

The supplier shall include as a line-item adder in the proposal, a ten (10) year maintenance service agreement. The maintenance shall be performed by factory-authorized service technicians capable of servicing the BESS. This agreement shall include quarterly preventative maintenance visits to verify operation and/or complete the following:
   1. All periodic BESS maintenance as recommended by the service manual.
   2. All electrical controls, maintenance, and calibrations as recommended by the manufacturer.
   3. All auxiliary equipment that is part of the emergency system.
   4. The Supplier shall guarantee emergency service.
   5. All expendable maintenance items are to be included in this agreement.
   6. A copy of this agreement and a schedule shall be provided in the submittal documents, detailing the scope of work and preventative maintenance service visit intervals.

3.8 DEMONSTRATION

A. Owner Training:
   1. Engage a factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain the packaged BESS.

END OF SECTION 263317

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260000

SCOPE OF WORK

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 SCOPE OF WORK

The following is a general listing of work items to be provided under this Contract which is not necessarily all inclusive, nor shall it limit the extent of the work or exclude any work shown or specified and not listed:

A. Provide a underground electrical services entrance as indicated on the contract documents.

B. Provide double ended switchboard with programmable breakers as indicated.

C. Provide distribution switchboards as indicated on the contract documents.

D. Provide stand-by power generation system including manual transfer switches, distribution panelboards, portable generator connection box, load bank, fuel tank, fuel polishing system, weatherproof enclosure, and required conduit and wiring.

E. Provide branch and distribution panelboards, protective devices, branch circuit wiring and raceways as indicated on the contract documents and as required.

F. Provide interior and exterior light fixtures, controls and wiring devices as shown.

G. Provide power circuit wiring, raceways, and devices for wiring of motors, appliances and equipment furnished by other trades as required.

H. Provide conduit, cable, and outlet system as required to extend and expand the existing data, telephone, and cable television systems as indicated on the contract documents.

I. Provide fire alarm electrical rough-ins, Vesda air aspirating smoke detector and associated tubing, conduit, boxes and cable, as indicated on the contract documents.

J. Provide server room UPS system as indicated on the contract documents.

K. Provide roof mounted photovoltaic system, including all mounting hardware, conduit, wiring, inverters, transformer, disconnect switches, and all required accessories and hardware as indicated on contract documents.

L. Provide battery energy storage system (BESS) as indicated on contract documents.

M. Provide underground conduit system for electrical services, IT and communications providers, including concrete encasement, handholes and pull ropes as indicated on contract documents.

N. Provide UL listed lightning protection system per NFPA 780.

O. Provide grounding system per Motorola R56 "Standards and Guidelines for Communication Sites" April 2017, and per NFPA 70.

P. Provide wiring devices as shown.

Q. Operationally test and check all installed equipment.

R. Provide temporary wiring, lighting and power as needed to suite the job requirements. Temporary wiring and lighting must be performed and removed in accordance with the latest recognized edition of the NEC.

S. Provide temporary electrical services to contractor's trailers. Minimum service size to each trailer shall be 200amp, 120/240V, single phase. Coordinate requirements and associated costs with contractors. Coordinate service with Central Hudson Gas and Electric utility Co.

T. Provide temporary telephone services to contractor's trailers. Coordinate requirements and associated costs with contractors. Coordinate service with local telephone utility Co.

END OF SECTION 260000

SECTION 260010

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to this Section.

1.2 CONFLICTS

A. If, in the interpretation of contract documents, it appears that the drawings and specifications are not in agreement, the Contractor is to contact the Engineer. The Engineer shall be the final authority. Addenda supersede the provisions which they amend.

B. In the absence of a written clarification by the engineer, the Contractor must install his work in accordance with the more stringent and/or costly condition. Contractor assumes full responsibility for any and all items furnished and installed without the written approval by the Architect or Engineer. Under no circumstances will a change order be accepted for work installed that was not approved by the Architect or Engineer.

1.3 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations:

EC: The Contractor performing the electrical work.
MC: The Contractor performing the heating, ventilating, air conditioning, and mechanical work.
PC: The Contractor performing the plumbing work.
GC: The Contractor performing the general building work.
CM: The Construction Manager.

References to the above designations are not intended to define contracts and/or subcontracts but only as reference to where items are shown on drawings or described in specifications.

B. Definitions:

Concealed: Embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.
Exposed: Not installed underground or concealed.
Noted: As indicated on the drawings and/or specified.

Indicated or Shown: As indicated or shown on the drawings.
Wiring: Conduits, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and items necessary or required in connection with or relating thereto.
Provide: Furnish and install

1.4 DRAWINGS AND SPECIFICATIONS

A. Intent:

1. Provide all items and work indicated on the Contract Documents. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable heating, ventilating, air conditioning, electrical and plumbing systems. Perform start-up and testing of each item and system to provide fully operable systems.
2. Provide all materials as required for complete systems, including all parts and labor obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be fully operational, prior to Owner's acceptance.
3. Neither the specifications nor the drawings undertake to illustrate or describe all items necessary for the work; it is expected that the EC shall be familiar with all applicable codes and shall provide an electrical installation in conformance with all applicable codes.
4. After review of the drawings and specifications, the EC shall be completely familiar with the function of all items included and that his bid shall reflect the inclusion of all hangers, racks, inserts, etc., necessary for a complete and operable system. The EC shall provide offsets, fittings and accessories as may be required to meet such field conditions. The EC shall make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in remuneration.
5. Items of work shown on the contract documents shall be furnished and installed as appearing on both drawings and specifications.
6. Equipment, conduit, etc., shall be installed to avoid interferences with the operation, servicing and maintenance of equipment.
7. Certain materials and equipment shall be provided by other trades. The EC shall examine the Contract Documents to ascertain these requirements. Unless specifically indicated as being supplied or installed by others, all items of work shown on the drawings or indicated in the specifications shall be included by the Contractor in his bid.
8. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as a result of the EC's failure to check or verify dimensions, measurements, etc., shall be corrected at the EC's expense.
9. The Contractor shall review the contract documents for the work of other trades, informing the Architect of any conditions which obstruct, interfere with, or in any way prevent him from completing his work in a first class manner.
10. The EC shall participate in the coordinated shop drawing procedure with the MC and PC. The EC shall note the location and elevation of all conduits 1-1/2" or greater.

1.1 DESCRIPTION OF WORK

A. Extent of electrical related work required by this section is indicated in the contract documents.

B. Provide 120-volt power to control panels provided by other trades, as required.

C. Work also includes minor items which may not be shown or mentioned, but are necessary for a complete, working electrical installation.

D. Provide all labor, materials, tools, equipment, transportation and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or herein.

E. Provide temporary power and lighting as required for construction operations and for ample job site security, and per Division 1.

F. If, in the interpretation of contract documents, it appears that the drawings and/or specifications are not in agreement, the one requiring the greater quantity or superior quality shall prevail, as decided by the Engineer. Addenda supersede the provisions which they amend.

G. Requirements of Regulatory Agencies: Applicable local, state and national laws, statutes, building codes and regulations as well as utility company requirements shall govern the complete installation.

H. Permits: Obtain permits and pay all fees required by the local inspecting authority.

I. Reference Standards: The latest applicable recognized editions of the following codes, standards, and specifications shall be considered minimum requirements:

1.	(BCNYS)	2020 Building Code of New York State
2.	(ECCCNYS)	2020 Energy Conservation Construction Code of New York State
3.	(FCNYS)	2020 Fire Code of New York State
4.	(ADA)	Americans with Disabilities Act
5.	(ANSI)	American National Standards Institute
6.	(ASTM)	American Society for Testing and Materials
7.	(CBM)	Certified Ballast Manufacturers
8.	(ETL)	Electrical Testing Laboratories
9.	(IBC)	International Building Code
10.	(ICEA)	Insulated Cable Engineers Association
11.	(IEEE)	Inst. of Electrical and Electronics Engineers
12.	(IES)	Illuminating Engineering Society
13.	(IPCEA)	Insulated Power Cable Engineers Association
14.	(IRC)	International Residential Code
15.	(ITL)	Independent Testing Laboratories
16.	(NETA)	International Electrical Testing Association
17.	(NBFU)	National Board of Fire Underwriters

18. (NEMA) National Electrical Manufacturers Association
19. (NESC) National Electric Safety Code
20. (NFPA) National Fire Protection Association
21. (UL) Underwriters' Laboratories
22. Local Codes
23. Public Health Service Regulations
24. Local Utility Standards and Regulations

J. Tests and Adjustments: The EC shall furnish testing equipment, instruments and personnel to perform any test procedures and adjustments required by the National Electrical Code, the utility company and the authority having jurisdiction to establish proper performance and installation of electrical equipment and materials.

K. Utility Requirements: Comply with the following

1. Central Hudson Gas and Electric "Specifications and Requirements for Electric Installations". Dated January 2024.
2. Perform all testing and inspections required by the utility company for a complete installation at all schools.
3. Any additional utility company requirements.

1.2 SUBMITTALS

A. General: Prepare and submit for approval, all submittals required by this and subsequent Division 26 sections, and by all other Contract Documents for this Project.

B. Types: Required submittals may include: Schedule of Values; List of Subcontractors and Materials; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Documents; Rebate Applications (including all submittals, backup information, copies of receipts, etc. needed to obtain all applicable electric utility company incentives); and other various administrative submittals.

C. Number and Format: One electronic PDF format copy.

D. Product Data: Submit for equipment, devices and materials as required in subsequent individual Division 26 sections. Product Data to consist of manufacturer's standard catalog cuts, descriptive literature and/or diagrams, in 8-1/2" X 11" format, and in sufficient detail so as to clearly indicate compliance with all specified requirements and applicable standards. Mark each copy to clearly indicate proposed product, included options, accessories, finish, size, type, etc.

E. Shop Drawings: Submit for equipment and systems as required in subsequent individual Division 26 sections. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the shop drawing submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, and model or series number where applicable, dimensions, nameplate data, sizes, capacities, types, fabrication materials, materials list, performance data, features, accessories, wiring diagrams, etc. in sufficient detail so as to clearly indicate compliance with all specified requirements and applicable standards. Submit Shop Drawings with related Product Data submittals.

Description	Shop Drawings	Wiring Diagram
Circuit and Motor Disconnects	X	
Overcurrent Devices	X	
Exterior Pad-Mounted Switchgear	X	X
Liquid-Filled Pad-Mount Transformer	X	X
Switchgear and Switchboards	X	X
Panelboards	X	X
Transformers, Under 600V	X	X
Metering equipment	X	X
Light Fixtures	X	X
Fire Alarm System	X	X
Wiring Devices	X	
Raceways	X	
Grounding	X	
Conductors & Cable	X	
Medium Voltage Terminations/Splices	X	
Generator	X	X
Generator Fuel Tank	X	
Load Bank	X	X
Battery Energy Storage System	X	X
PV System	X	X
Lightning Protection System	X	X
Deicing System	X	X
Handholes	X	X

F. Operation and Maintenance Data: Upon completion of the work, prepare and deliver to the Owner complete operating and maintenance manuals for systems and major equipment installed as outlined in Division 1 of the project specifications. Include all updated materials listed above in submission, including as-built wiring diagrams.

G. Maintenance Manuals: Include operating and maintenance data for each Division 26 section requiring a Product Data and/or Shop Drawing submittal. Include the respective Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer's printed operating, maintenance, trouble shooting, repair, adjustment and emergency instructions and diagrams, complete replacement parts listing, and the name, address and telephone number of the installing contractor and/or subcontractor, and for the nearest manufacturer's authorized service dealer.

H. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all electrical equipment and devices, routing of major interior building raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Make provisions for delivery and safe storage of all materials. Check and properly receipt material to be "furnished by others" to contractor, and assume full responsibility for all materials while in storage with full visible identification and information.

B. Delivery of Equipment: Make the required arrangements with General Contractor for the introduction into the building of equipment too large to pass through finished openings. Protect equipment against weather, damage, and vandalism.

1.4 PROTECTION OF EQUIPMENT

A. The EC shall, at his own expense, protect his work, material and equipment and is liable to injury during the construction period. The EC shall be held responsible for all damages and theft until his work is fully and finally accepted.

1.5 PROJECT CONDITIONS

A. Existing Conditions: Field verify all conditions that will determine exact locations, distances, levels, dimensions, elevations, etc. Review all drawings of other trades and report any conflicts to the Architect/Engineer which will affect the project cost.

B. Dimensional information used for layout and locations shall be taken from architectural or structural drawings used by the construction trades.

C. Certain electrical drawings are diagrammatic and have no dimensional significance. Locations of equipment are to be as:
1. Shown on the dimensioned drawings;
2. Directed in the field;
3. Required for proper connection of equipment to be served;
4. Required for proper symmetry in the space involved;
5. With deviations made only with specific approval of Architect/Engineer.

D. Division 26 shall review the drawings of other divisions, exchange shop drawings with them and cooperate in the preparation of space layouts as required to avoid conflicts and interferences with the installation of other trades in advanced stages of construction. Refer to Division 1specfication sections.

E. The Owner or Owner's representative reserves the right to relocate an outlet or outlets, six (6) feet in any direction from locations indicated on plans, before roughing-in, with no change in contract price.

1.6 PREPARATION

A. If products and materials are specified or indicated on the drawings for a specific item or system, those products or materials shall be used. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of shop drawings.

B. All products shall be new, clean, undamaged, and free of defects and corrosion.

C. All products shall be shipped and stored in a manner which shall protect them from damage, weather and entry of debris. If items are damaged, they shall not be installed. The EC shall take immediate measure to obtain replacement or repair in order to maintain the schedule.

D. The EC shall verify that all materials he or his suppliers select conform to the requirements of the drawings and specifications. Transmittal of drawing and specification information to manufacturers supplying materials, and adherence to these requirements is the EC's responsibility. Approval of manufacturer's name by the Engineer does not release the EC of the responsibility for providing materials which comply in all respects with the requirements in the contract documents.

1.7 ALTERATION WORK

A. The EC shall inspect the site and become familiar with the condition of the premises and the scope and character of work required. Additional compensation for adverse field conditions shall not be approved.

B. The EC shall minimize interference with the working routine of occupied areas, by coordinating the performance of his work in a manner acceptable to all groups involved.

C. The EC shall not interrupt any of the building's electrical services in any way without the expressed written permission of the Owner. Ample written notice of shutdowns shall be given well in advance to the Owner. Interruptions and interference shall be made as brief as possible and only at times as stated by the Owner. When temporary loss of services is unavoidable, it shall be made at times as shall cause the least interference with the established routine. The EC shall maintain electrical continuity to adjoining spaces which may be outside the contract area.

D. The EC shall obtain the Owner's permission before utilizing any room or any other part of the building as a shop or for storage of electrical materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Acceptable electrical materials and equipment shall be new and of the type and quality specified or shown on drawings. They shall be listed by Underwriter's Laboratories, Inc. and bear their label where standards have been established. Permission to substitute equal or superior items of materials and equipment may be requested by following the procedure outlined in the Division 1 "Substitutions" of the project specifications. Completion date will not be extended because of any time lost due to consideration or installation of substitutions. All coordination of substituted equipment shall be the Contractor's responsibility.

B. In purchasing materials and equipment to be furnished and installed under this contract the contractor shall convey to the Owner all rights and privileges extended by the various manufacturers thereof in the form of warranties and guarantees covering quality and performance of such items.

C. Fire-stopping for all conduit and cables passing through fire rated floors and walls shall be accomplished by the use of preformed square tubes with an intumescent material insert that adjusts automatically to cable additions or subtractions. Product shall be provided with steel wall plates allowing for single or multiple devices to be ganged together. Product shall be Specified Technologies Inc. (STI) EZ-PATH and intumescent sealant series SSS fire rated pathway, Wiremold FlameStopper or equal.

D. All electric materials and equipment are to comply with all utility company requirements.

PART 3 EXECUTION

3.1 GENERAL

A. All work described in these contract documents and all work required by this Contract shall be executed in a thoroughly substantial and workmanlike manner by skilled mechanics in the various trades involved. Follow manufacturer's instructions for installing, connecting and adjusting all equipment.

3.2 CUTTING AND REPAIRING

A. All normal cutting, drilling, chasing and patching required for accommodation of the electrical work shall be accomplished by the EC. Work shall be carefully laid out in advance and performed in a skilled manner. Any damage to the building piping, equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.

3.3 EQUIPMENT LAYOUT

A. Install all equipment to permit removal (without damage to other parts) of coils, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. Provide access panels in equipment, ducts, etc., as required for inspection of interiors and for proper maintenance.

B. Arrange equipment to permit access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging doors and access panels.

C. The EC shall provide the Owner with all special tools needed for proper operation, adjustment and maintenance of equipment.

3.4 TESTS AND INSPECTIONS

A. Notify proper authorities for inspections of work required by applicable codes, rules or regulations. Completed work must be inspected and certified by an inspection agency acceptable by the Engineer. Systems to be inspected include:

1. Underground Work
2. Concealed Work
3. Distribution and Branch Circuits
4. Illumination System
5. Grounding System
6. Receptacles
7. Connections to Mechanical Equipment
8. Transformers
9. Panelboards
10. Switchboards
11. Exterior Pad-mounted Primary Switchgear
12. Exterior Liquid-filled Primary Transformer
13. Underground Primary Electrical Service
14. Temporary Building Services

B. Operational test will be performed on all electrical equipment as recommended by the applicable manufacturer. Test all wiring and connection for continuity and grounds before energizing any system.

C. The grounding electrode system to include the column ground conductors shall be tested to show satisfactory grounding. The test shall be performed by the EC or his designated representative. A "Fall Off Potential Test" shall be performed on the grounding electrode system. The test equipment used to perform this test shall be designed specifically for "Fall Off Potential" Testing. This test shall be performed with U.L. listed testing equipment. Resistance to ground shall in no case exceed five (5) ohms.

D. Prior to the acceptance of the completed work under this Contract, the EC shall balance and test the complete installation specifically accomplishing the following:

1. Load each panel individually, balancing the load on each phase by necessary recircuiting. Record loads.
2. Load distribution panels, balancing the load on each phase by necessary recircuiting. Record loads.
3. Make necessary changes in feeder connection to balance entire system.
4. Check for grounds, shorts, etc., on all fixtures, equipment, apparatus, etc., and leave system in satisfactory operating condition.
5. Load test various parts of the system as directed by the Engineer, to determine if excessive heat is developed in panels, switches, wiring, etc.

E. Clean up, remove all waste material each day, and clean all lamps, lenses, lighting fixtures, cabinets, and electrical equipment prior to final inspection.

F. Coordinate all inspections and testing requirements with the utility and the authority having jurisdiction.

G. Perform all tests as required by the utility company and the authority having jurisdiction.

H. Schedule all inspections and testing as required by the utility and the authority having jurisdiction.

I. Perform testing as indicated in section 260810 and any other division 26 sections.

3.5 ADMINISTRATION AND SUPERVISION

A. The EC shall have a licensed electrician, with-in the state of New York, on site at all times to personally supervise the electrical work, and shall be acceptable by the Architect and Owner, prior to commencing any electrical work.

END OF SECTION

SECTION 260024

ELECTRICAL TRENCHING, BACKFILL, AND COMPACTION

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 excavating and backfilling for underground electrical utilities and appurtenances.

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations indicated on Drawings, and the reuse or disposal of materials removed.

B. Subgrade: The undisturbed earth, or compacted soil layer, immediately below granular subbase or topsoil materials.

C. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Contracting Officer. Unauthorized excavation, as well as remedial work directed by the Contracting Officer, shall be at the Contractor's expense.

D. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Test Reports: Submit the following reports from the testing service directly to Architect, with copy to Construction Manager.

1. Field reports; in-place soil density tests.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Employ a qualified independent geotechnical engineering testing agency to preform required field testing.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Contracting Officer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

B. Explosives: Use of explosives is not permitted.

C. Protection of Persons and Property: Provide temporary barricades at open excavations occurring as part of this work.

D. Protection of Existing Trees: Protect existing trees indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising bark, or smothering of trees by stockpiling excavated materials within drip line.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation other deleterious matter.

B. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Backfill and fill Materials: Satisfactory soil materials.

D. Subbase and base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 EXECUTION

3.1 PREPARATION

A. 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.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations and from ponding on prepared subgrades.

3.3 EXCAVATION

A. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill where directed by the Contracting Officer. Place, grade, and shape stockpiles for proper drainage. Legally dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated slopes, lines, depths, and invert elevations. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

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 higher than top of pipe or conduit, unless otherwise indicated. Clearance: As indicated on Drawings.

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 stones and sharp objects to avoid point loading.

1. For pipes of conduit less than 6 inches 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 or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.

3.7 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

C. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. 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 acceptable backfill materials as shoring and bracing, and sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 COMPACTION

A. Place backfill and fill materials in layers not more then 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D1557:

1. Under driveway, compact the top 12 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
2. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill of fill material at 90 percent maximum dry density.

3.9 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency Service: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.

B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

END OF SECTION 260024

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 260040

IDENTIFICATION

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 DESCRIPTION

A. The EC shall furnish all labor, materials, equipment, and services necessary for, and incidental to, the installation of the Identification system as shown on the drawings, and/or as specified herein.

B. All items of equipment and all circuits shall be identified by color codes, tags, nameplates and directory cards as herein after specified.

1.3 COLOR CODING

A. All conductors used in the construction of the Electrical systems shall be color coded in accordance with the Article 210-5 of the NEC, latest recognized edition.

B. Where colors are not available, use black with bands of plastic tape. LOCATE BANDS WHEREVER CONDUCTORS WILL BE ACCESSIBLE. Bands shall be at least one (1) inch wide in wire ways, etc. where long lengths of wire would be accessible and banded every 2'-0". Color code all phase conductors for 120/208 volts: Black, Red and Blue with White neutral; and, for 277/480 volts: Brown, Orange and Yellow with Grey neutral.

C. Where parallel runs occur, each set of parallel conductors shall be differentiated, in addition to the previous specified color coding, by a number of one (1) inch wide bands of purple plastic tape -- one band per conductor for first set, two for second set, etc. Locate as required in "B" above for phase identification.

D. All grounding conductors shall be green or green with a yellow trace, except as allowed by Article 250-57b exception No. 1 of the NEC, latest edition.

1.4 TAGS

A. All feeder and branch circuit conductors shall be tagged in all panelboards, relay cabinets, pull boxes, and gutter spaces through which they pass. Tags shall show circuit number and panel to which the conductors are connected.

B. All tags in damp locations or where moisture damage to tags is possible, shall be made of waterproof materials, and marked in such a way that repeated contact with water will not render the tag illegible. Metal tags acceptable.

1.5 NAMEPLATES

A. Provide and install a nameplate on all equipment furnished and/or installed under this Contract. Nameplates shall also be installed by the EC on all items, such as disconnect switches, motor starters, and variable frequency drives supplied by others, for installation by EC.

B. Engraved nameplates shall be black lamacoid with white letters and attached with sheet metal screws, rivets or epoxy glue in a location so as to be visible from a normal viewing position. Do not use pressure sensitive tape to fasten nameplate. Mount nameplates indicating designation, voltage and phase on switchboards, distribution panelboards, branch circuit panelboards, and control panels with minimum 1/2" high letters. Where equipment is flush mounted in the finished areas, mount nameplates on inside of enclosure. Where disconnect switches are internally mounted in equipment, label access door "Disconnect Inside". Install labels, showing proper fuse type and size, inside all fusible safety switches and panelboard switch units.

C. Each nameplate shall clearly indicate:

1. Device function
2. Equipment served
3. Panel name
4. Circuit number
5. Voltage & Phase

All as applicable, for example:
DISCONNECT
EXHAUST FAN NO. EF-1, BOILER ROOM
PANEL A / CIRCUIT 6208 VOLT / 1 PHASE

D. Unless otherwise directed, nameplates shall be five (5) inches long by three (3) inches high for panelboards, terminal boxes, relay terminal boxes, relay cabinets, etc., and three (3) inches long and one (1) inch high for all other equipment.

1.6 LABELS

A. Provide and install a label on all wall switches and receptacles. Labels shall also be installed by the EC on all items, such as toggle switch type disconnects and manual motor starters, supplied by others, for installation by EC.

B. Labels shall be adhesive back laminated tape with black letters on a clear background. Brother PT-8000 with M4991 tape, or equal. Unless otherwise directed, labels should be two (2) inches long by one 1 inch high.

C. Each label shall clearly indicate:

1. Equipment served (for switches)
2. Panel name
3. Circuit number
4. Voltage & Phase

All as applicable, switch example:
GENERAL LIGHTING
PANEL LP1 / CIRCUIT 6
277 VOLT

All as applicable, receptacle example:
DEDICATED CIRCUIT
PANEL PP1 / CIRCUIT 6,8
208 VOLT / 1 PHASE

1.7 DIRECTORY CARDS

A. Provide and install a neatly typed directory card for all panelboards.

B. For panelboards, directory cards shall contain a list of circuit numbers, which shall correspond to those listed on the plans, and a brief description of the load(s) served.

C. Circuit over-current protective devices shall be identified on the face of the panelboard with the corresponding circuit number.

D. All directory cards shall be permanently mounted in a suitable card holder built into the equipment.

E. The EC shall assume responsibility for the accuracy of any and all directory cards, and shall correct any errors by preparing NEW CARDS. Crossing out data, erasures, etc., will not be acceptable.

F. Where circuits are added to existing panelboards, provide new directory cards as specified above for new panelboards.

G. A copy of all directory cards shall be included in the operating manual previously specified.

1.8 SPECIAL SYSTEMS

A. All conductors associated with any and/or all special systems to be installed under this Contract, shall be color coded.

B. Color coding shall be in accordance with the system manufacturer's standards, or, if such standards do not exist, the EC shall submit a scheme to the Architect and Engineer for their review prior to system installation.

C. The colors green, and green with yellow trace, shall be reserved for grounding conductors; any other combination of colors and traces shall be permissible for coding conductors.

D. In multiconductor cables, in lieu of color conductors, the EC, MAY use cables where each conductor insulation is stamped with a unique number at least every six inches. Such identification shall not be confined to areas where sheath has been removed but shall extend the full length of the conductors.

E. Color coding shall be of such an extent that each conductor located in the same conduit, pull box, junction box, cabinet, etc., shall have a unique color code. However, conductors supplying similar functions to different areas of the project should have similar (not identical) color codes (e.g., differentiated by number of traces).

F. All panels, equipment, pull boxes, and conduit shall have voltage labels such as Panduit part # PCV, or equal.

END OF SECTION 260040

SECTION 260110
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 and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

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 Corp.
   b. Western Tube & Conduit Corp.
   c. Wheatland Tube Co.
   d. Or equal.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. EMT: Comply with ANSI C80.3 and UL 797.
6. FMC: Comply with UL 1; zinc-coated steel or aluminum.
7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal 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. Cooper/Crouse-Hinds.
   b. OZGedney Co.
   c. Thomas & Betts Corp.
   d. Or equal.

2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Fittings for EMT:

   a. Material: Steel.
   b. Type: Compression.

6. 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.

C. Joint Compound for IMC, GRC, or ARC: 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.

SECTION 263613

NON-AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Product Data: Catalog sheets, specifications and installation instructions.

C. Contract Closeout Submittals:
1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owners Representative.

1.2 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. ETL/UL LISTED to 1008 Standards..UL 50 LISTED

PART 2 PRODUCTS

2.1 MANUAL TRANSFER SWITCHES

2.2 QUICK CONNECT POWER PANEL MANUAL TRANSFER SWITCH

A. DOCKING STATION

1. Manufacturers: Basis of Design, subject to compliance with requirements, provide products by the following:

2. TRYSTAR: Dual Purpose Docking Station.

B. GENERAL REQUIREMENTS:

1. Enclosure:.

a. NEMA 3R Rain-Tight Aluminum Enclosure.

b. Pad-lockable front door shall include a hinged access plate at the bottom for entry of temporary cabling that prevents unauthorized tampering while in use.

c. NEMA 3R Integrity shall be maintained while temporary cabling is connected during use.

d. Front and Side shall be accessible for maintenance.

e. Top, Side, and Bottom shall be accessible for permanent cabling.

f. Powder coat - Paint after fabrication shall be Hammer tone Gray,

C. PHASE, NEUTRAL, AND GROUND BUSBAR

1. Material: Silver-plated Copper
2. Equipment Ground Bus: bonded to box.
3. Isolated Ground Bus: insulated from box.
4. Ground Bus: 50% of phase size.
5. Neutral Bus: Neutral bus rated 100 percent of phase bus.

D. TEMPORARY CONNECTIONS

1. Connectors shall be Camlok SERIES 16, color coded according to system voltage. Mounted on gland plate.
2. Camlok connections shall be Bus Bar Style, Cabling or Double Set Screw is not acceptable
3. Camlok connection shall be protected against accidental contact while not in use.

E. Permanent Connection shall be factory installed broad range set-screw mechanical type, located behind a physical barrier.

F. TRANSFER SWITCH CONFIGURATION

1. SBDS/DBDS shall have Kirk Key interlocked circuit breakers to serve as MTS function.
2. Interlock circuit breakers shall be located behind pad lockable door to prevent any tampering by unauthorized personnel.

G. VOLTAGE AND AMPERAGE

1. 208/120V, three phase, 4 wire.
2. 2000amp.

H. PHASE ROTATION MONITOR DEVICE

1. Phase monitoring relay to be Siemens 3U4512-1AR20 or equal and factory installed.

I OPTIONAL EQUIPMENT

1. Kirk Key door interlock
2. Listed Monitoring Device
3. Surge Protection Device
4. Alarm contacts
5. Auxiliary contacts for monitoring by Microgrid Controller.

2.3 NAMEPLATES

A. General: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.

1. Phenolic: Two color laminated engravers stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Phase Relationship: Correctly phase emergency and normal service so that motor rotation will not reverse upon transfer from normal to emergency.

B. Identify each switch, indicating purpose or load served. Also include instructions on the nameplate indicating operating procedure for safe manual transfer.
   1. NEMA 3RX Enclosures: Attach nameplate to the cover using adhesive specifically designed for the purpose, or mount nameplate on wall or other conspicuous location adjacent to switch. Do not penetrate enclosure with fasteners.

C. The complete Manual Transfer Switch shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure compliance with the specification requirements.

D. The manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

E. The Manual Transfer Switch manufacturer shall maintain a national service organization of company- employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

END OF SECTION

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 264112

LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

A. Underwriters Laboratories Inc. - Installation Requirements for Lightning Protection Systems UL 96A".

1.2 DESIGN REQUIREMENTS

A. The Lightning Protection System shall be designed by the engineering staff of the manufacturer of the equipment proposed to be installed.
   1. Design approach based on UL 96A.
   2. Obtain data for the system design from field investigation of the actual structures to be protected.

1.3 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.
   1. The shop drawings, and product data shall bear the seal of a professional engineer licensed to practice in the State of New York.

C. Shop Drawings: Detailed scale drawings of the complete system as proposed to be installed.

D. Product Data:
   1. Catalog sheets, specifications, and installation instructions.
   2. Bill of materials.

E. Samples: One of each product if requested. Samples will be returned and if approved, may be used in the Work.

F. Quality Control Submittals:
   1. Proof that the firm installing the system is actively engaged in the installation of UL Master Labeled Lightning Protection Systems.
   2. Installer's Qualifications Data: Include the following for each person who will be performing the Work:
      a. Name.
      b. Employers name, business address and telephone number.
      c. Names and addresses of the required number of similar projects worked on which meet the experience criteria.

G. Contract Closeout Submittals:
1. Master Label Application Form: One copy of completed and accepted Master Label Application Form from Underwriters Laboratories.

1.4 QUALITY ASSURANCE

A. Equipment Qualifications For Products Other Than Those Specified:
1. At the time of submission provide written notice to the Director of the intent to propose an "or equal" for products other than those specified. Make the "or equal" submission in a timely manner to allow the Director sufficient time to review the proposed product, perform inspections and witness test demonstrations.
2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.
a. Make arrangements with the owners of 2 installations (selected by the Director) for inspection of the installations by the Director's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Director a minimum of 3 weeks prior to the availability of the installations for the inspection, and provide at least one alternative date for each inspection.
b. Only references from the actual owner or owner's representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual owners of the proposed products, are not acceptable.
1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.
3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.
a. Make arrangements with the test facility for the Director's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Director a minimum of 3 weeks prior to the availability of the test facility, and provide at least one alternative date for the testing.
4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.

B. Installers' Qualifications: The system shall be installed by a firm actively engaged in the installation of Underwriters Laboratories Inc. Master Labeled Lightning Protection Systems. The persons performing the Work of this section and their supervisor shall be personally experienced in lightning protection systems and shall have been regularly employed by a Company engaged in the installation of this type system for a minimum of 3 years.
1. Furnish to the Director the names and addresses of 5 similar projects which they have worked on during the past 3 years.

C. Underwriters Laboratories Inspection:
1. Send completed Master Label Application Form to Chicago Office of Underwriters Laboratories Inc.
2. After completion of UL inspection and acceptance, install Master Label at appropriate location.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Heary Brothers Lightning Protection Co., Inc., Springville, NY.

B. Independent Protection Co., Inc., Goshen, IN.

2.2 MATERIALS

A. All materials for this installation shall be Class I as defined by Underwriters Laboratories Inc. for use on structures less than 75 feet in height.

B. Copper shall be of the grade ordinarily required for commercial electrical Work, generally designated as being 98 percent conductivity when annealed.

C. Air Terminals:
1. Roof Air Terminals: Solid copper having a minimum diameter of 1/2 inch and a length of not less than 10 inches nor more than 24 inches.

D. Conductors:
1. Main Conductors - Cable:
   a. Copper weighing not less than 187-1/2 lbs per 1000 feet.
   b. The size of any wire in the conductor not less than No. 17 AWG.
   c. Minimum cross sectional area of 59,500 cir. mil.
2. Main Conductors - Solid Strip:
   a. Thickness not less than No. 14 AWG.
   b. Width not less than 1 inch.
      1) If perforated, width shall be increased equal to diameter of perforations.
3. Secondary Conductors - Cable:
   a. Minimum of 13 wires with each wire a minimum size of 17 AWG.
4. Secondary Conductors - Solid Strip:
   a. Thickness not less than No. 16 AWG.

b. Width not less than 1/2 inch.
   1) If perforated, width shall be increased equal to diameter of perforations.

E. Attachments: Fasteners shall be of suitable configuration for the intended application and of the same material as the conductor. Nails, screws, or bolts employed to secure the fasteners shall be of the same material as the fasteners or of material which is as resistant to corrosion as that of the fasteners. (Galvanized or plated steel nails, screws, or bolts are not acceptable).

F. Connections and Splices: Connectors and splices shall be of suitable configuration and type for the intended application and of the same material as the conductor.

G. Rod Electrodes: Solid copper or copper-clad ground rods; 3/4 inch minimum diameter, 10'-0" long.

H. Guard Pipes: Copper, 3/4 inch O.D. x 8'-0" long with bonding wedge.

I. Surge Arresters: Joslyn J9200 Series (voltage rating to suit system's secondary characteristics).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the Lightning Protection System as required to obtain UL Master Label.

B. Surge Arresters: Install surge arresters on electric service entrance secondary conductors.

C. Coordinate installation of lightning protection system with roofing contractor and photovoltaic system contractor.

D. Excavation, Backfill and Restoration: Excavate and backfill as required to install grounding system. Restore lawns, pavement, walks, or other exterior surfaces displaced or marked by the Work of this Contract to their original conditions, as approved by the Owner's Representative.

END OF SECTION

SECTION 268513

ELECTRIC DE-ICING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Description of Work: Provide electric gutter (and roof) de-icing and roof drain heating systems as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturers' descriptive literature for each type of cable, device, equipment and accessory to be used on the project.

B. Shop Drawings: Detailed roof plan and elevation drawings, installation details, and wiring diagrams for each gutter de-icing system and each roof drain heating system. Drawings to show full extent of each system required including cable length(s) (which are only approximated on the Drawings), all required system and mounting accessories, and all associated control devices and all power and control wiring, including required power source circuit sizes.

1. Discrepancies: Advise Architect/Engineer of any and all discrepancies including those involving power circuits shown versus required.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Raychem "IceStop" System.

2.2 GUTTER DE-ICING CABLES

A. Raychem # GM-2X.

B. Description: Self-limiting, flexible, of parallel circuit construction, power output rating of 12 watts/foot at 32°F when exposed to ice or snow, and maximum 6 watts/foot at 32°F when dry, for 208 volt application, and UL listed for roof and gutter de-icing.

C. Construction: Nickel plated copper bus wires, radiation-crosslinked self-regulating conductive core, radiation-crosslinked modified polyolefin jacket, tinned copper braid, and UV-stabilized modified polyolefin outer jacket.

2.3 ROOF HOT EDGE

A. Hotedge Roof Ice Melt: #Pro2X.

B. Description: .021" copper or 50,000 psi galvanized steel (24 gauge) or 0.032" aluminum.

C. Heating System: Commercial grade self-regulating UL listed for roof and gutter deicing heat cable, 208-277VAC.

D. Available in 5'-10' lengths as well as 16 colors, and color match to match standing metal seam roof color.

E. NEC Compliance: Product shall comply with NEC Art. 426.

F. Warranty: 20 year limited on metal product, 10 year limited warranty on heating cable failure.

2.4 INSTALLATION COMPONENTS

A. Description: Power connection kits, splice kits, end seal kits, mounting clips and adhesive, downspout hangers, aluminum tape, all as recommended and supplied by the manufacturer.

2.5 MASTER CONTROLLERS

A. Raychem #APS-4C-208/240V, 3 Phase, 50amp.

B. Description: Gutter de-icing master controller, with ground fault protection (GFEP, auto-testing, adjustable 30-120 mA). Integral control transformer, three sets of contacts rated 50 amps at 208 volts, adjustable hold on timer, high limit thermostat ($40^{o}F$ – $90^{o}F$), polycarbonate NEMA-3R enclosure.

2.6 SATELLITE CONTROLLERS

A. Raychem #SC-40C-208/240V.

B. Description: Gutter de-icing slave controller, with enclosure, ground fault protection and contacts same as for master controller.

2.7 SNOW AND ICE SENSORS

A. Snow Sensors: Raychem #CIT-1 (Snow Owl). Combination ambient temperature and moisture sensor, aerial type, limiting ice melting to conditions below $38^{o}F$ with moisture present. Include or fabricate necessary mounting hardware.

B. Gutter Sensors: Raychem #GIT-1. Similar to snow sensor but for mounting directly in gutter.

2.8 CONTROL CABLES

A. General: As required, NEC Class 2, plenum-rated.

PART 3 EXECUTION

3.1 INSTALLATION TRAINING

A. General: Obtain the services of the manufacturer's authorized representative to provide instruction on the installation of all components of the electric gutter de-icing systems, prior to commencing installation for this Project. Review the specific application areas, and comply with the recommendations of the manufacturer's representative for the optimum installation.

3.2 GUTTER DE-ICING CABLE INSTALLATION

A. General: Cable for each gutter de-icing system to be continuous without splice.

B. In Gutters: Install cables for full of length of gutter as indicated.

C. Along Roof Standing Seams: Standing seams are spaced 12" apart. Provide gutter de-icing cable on both sides of every other seam, as indicated, with loop at top. Loops to be just above the roof snow guards.

D. In Downspouts: Provide downspout hanger to support and protect cable at entry to each downspout. Run cable down full length of downspout, make loop at downspout discharge and then run cable back up to gutter as indicated. Loop at bottom of downspout to extend three inches past end of discharge.

3.3 ROOF DRAIN HEATING SYSTEMS

A. General: Cable for each roof drain heating system to be continuous without splice.

B. For Each Roof Drain: Provide heating cable in star pattern as detailed/recommended: Install cables for full of length of gutter as indicated.

C. In Roof Drain Leaders: Provide hanger to support and protect cable at entry to each leader. Run cable down full length of leader, make loop at leader discharge and then run cable back up to roof drain as indicated. Loop at bottom of leader to extend approximately 24" into respective catch basin.

3.4 POWER CIRCUITS

A. Connect each de-icing and roof drain heating cable (via respective master or slave controller) to indicated panelboard and circuit.

3.5 INSTALLATION COMPONENTS

A. General: Provide as recommended by the manufacturer for a complete and secure installation.

3.6 MASTER AND SLAVE CONTROLLERS

A. General: Provide four master controllers (one each per four sides of building) and provide slave controller(s) as indicated, for additional de-icing circuits as indicated.

B. Power Connections: Connect each controller to indicated 208 volt, single-phase circuit, and to respective gutter de-icing or roof drain heating cable.

C. Control Connections: Connect controllers together and to remote snow and gutter sensors as required for proper system operation.

3.7 SNOW AND GUTTER SENSORS

A. General: Locate and install near gutter as indicated. Mount and orient for maximum effectiveness in detecting snow. Exact location to be as approved by manufacturer and Architect/Engineer. Connect each sensor separately to master controller as required for proper operation.

3.8 CONTROL CABLES

A. General: Low voltage control wiring may be run without conduit above suspended ceilings. Neatly support and secure cables to building structure above ceiling at least every five feet. Where installed above non-accessible ceilings and the like, and where exposed to damage, install cables in conduit.

3.9 CHECKOUT AND TESTS

A. Checkout: (By manufacturer's authorized representative). Inspect each gutter de-icing and roof drain heating system for a complete and proper installation. Correct any deficiencies.

B. Tests: After installation, test each length of cable using a 2500 VDC insulation resistance tester (megger). The insulation resistance between the braid and the bus wires must be at least 20 megohms. Replace any cable which does not meet this test.

END OF SECTION

SECTION 267116

ELECTRICAL POLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood poles.
2. Cross arms.
3. Pole hardware.

B. Related Requirements:

1. Central Hudson Gas and Electric "Specifications and Requirements for Electrical Installations" dated January 2024.

1.2 REFERENCE STANDARDS

A. American National Standards Institute:

1. ANSI O5.1 - Wood Poles - Specifications and Dimensions.

B. American Wood Protection Association:

1. AWPA U1 - Use Category System: User Specification for Treated Wood.

C. ASTM International:

1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A475 - Standard Specification for Zinc-Coated Steel Wire Strand.

D. The Institute of Electrical and Electronics Engineers, Inc.:

1. IEEE C2 - National Electrical Safety Code (NESC).
2. IEEE C135.1 - Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction.
3. IEEE C135.2 - Standard for Threaded Zinc-Coated Ferrous Strand-Eye Anchor Rods and Nuts for Overhead Line Construction.

E. UL, Inc.:

1. UL 96 - Standard for Lightning Protection Components.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: Submit manufacturer information showing materials and construction of hardware.

E. Shop Drawings: Indicate pole locations and details of pole line construction.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

I. Qualifications Statement:

1. Submit qualifications for installer.

J. Product Cost Data:

1. Submit cost of products to verify compliance with Project sustainable design requirements.
2. Exclude cost of labor and equipment to install products.
3. Provide cost data for following products:

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Record actual locations of poles, guys, and anchors.
2. Record actual dimension of required horizontal and vertical clearances.

1.5 QUALITY ASSURANCE

A. Perform Work according to IEEE C2 for <_____> loading conditions and Grade <_____> construction.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this Section with minimum five years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Handling:

1. Handle treated poles with tools that do not produce indentations greater than 1 inch deep.
2. Do not drag treated poles along ground.
3. Do not apply tools to section of treated poles between 1 foot above and 2 feet below ground line.

C. Storage:

1. Store poles according to manufacturer instructions.
2. Stack poles stored for more than two weeks on decay-resistant skids arranged to support poles without noticeable pole distortion.

D. Protection:

1. Protect poles from damage and decay by stacking to allow free circulation of air.
2. Maintain 1-foot minimum spacing between bottom pole and ground or ground vegetation.
3. Do not store poles above decayed or decaying wood.
4. Provide additional protection according to manufacturer instructions.

PART 2 PRODUCTS

2.1 POLES

A. Wood Poles:

1. Comply with ANSI O5.1.
2. Material: Treated.
3. Minimum Length: 45 feet.
4. Minimum Class: 2

B. Preservative Type: [**Oil-borne**] [**Waterborne**] <_____>.

2.2 CROSS ARMS

A. Cross Arms and Timbers:

1. Material: Straight-grained southern yellow pine.
2. Tolerance: Free of bends and twists to within 0.1 inch/foot of length.

B. Wood Preservative:

1. Type: CCA, with oil based emulsion treatment for better pole climb ability for lineman.
2. Comply with AWPA U1.

2.3 ACCESSORIES

A. Cross-Arm Braces:

1. Material: Galvanized structural steel.
2. Comply with ASTM A123.

B. Miscellaneous Pole Hardware: Hot-dip galvanized after fabrication.

C. Angle Braces:
1. Fabrication: Drop-formed in one piece from 1-3/4-by-1-3/4-inch angle.

D. Flat Braces:

1. Size: 1/4 by 1-1/4 inches.

E. Anchor Rods and Nuts: Comply with IEEE C135.2.

F. Bolts and Nuts: Comply with IEEE C135.1.

G. Butt Plate: Copper.

H. Guy Strand:

1. Description: High-strength, seven-strand galvanized-steel cable.
2. Comply with ASTM A475.
3. Class A

I. Guy Termination Type: Three-bolt clamp.

J. Guy Guards:

1. Material: Plastic.
2. Length: 8 feet.
3. Color: Yellow.

K. Ground Wire:

1. Conductors: Soft-drawn copper.
2. Minimum Size: 6 AWG.

L. Air Terminal:

1. Material: Copper.
2. Height: 24 inches.
3. Comply with UL 96.

PART 3 EXECUTION

3.1 PREPARATION

A. Plug unused holes in poles using dowel pins of treated wood.

B. Treat field-cut gains and field-bored holes with preservative.

C. Cut gains on face of pole, with gained surfaces in parallel planes.

D. Shortening:

1. Shorten poles as required by cutting from top end.
2. Apply hot preservative to shortened end of pole.

E. Central Hudson Gas & Electric (CHG&E) shall designate the riser pole, or other point of termination from which the Owner's electric service lateral will originate. No more than two (2) electrical riser conduits are permitted per pole. All risers shall be on the non-traffic side(s) of the pole and allow for conductor installation to CHG&E space on pole without conflict from other utilities equipment/cables. Where the riser must be installed facing traffic due to existing obstacles, contact the CHG&E prior to installation. CHG&E will, at no expense to the owner, install one (1) overhead primary extension to this pole.

F. All primary risers shall be galvanized steel RMC. CHG&E will install cutouts, lightning arresters, and terminate the cable conductors to its distribution system on CHG&E owned poles. The Electrical Contractor shall make terminations using CHG&E approved equipment on de-energized Customer poles. The Electrical Contractor is allowed to install equipment on energized Customer poles only where the work is performed by qualified worker(s), according to OSHA Standard 1910.269. If necessary and at their discretion, CHG&E will provide and install all Customer required equipment at the Electrical Contractors expense. For additional details on primary riser installations, refer to CHG&E "Specifications and Requirements for Electrical Installations" Dated January 2024 see Figure 45 for 7.6kV single phase, Figure 46 for 13.2kV three phase, Figure 47 for 19.9kV single phase, and Figure 47 for 34.5kV three phase.

3.2 INSTALLATION

A. Setting Holes:

1. Dig setting holes large enough to permit use of tampers to full depth.
2. Place earth in maximum 6-inch layers, and compact to 90 percent of maximum density.

B. Poles:

1. Set poles in straight line.
2. Place curved poles with curvature in line with lead pole.
3. Maintain even grade.
4. Set poles plumb.
5. Rake poles located at corners, angles, and dead ends such that poles are plumb after line installation.

6. Do not install poles along edge of cuts and embankments or where soil is in danger of washing out.

C. Cross Arms:

1. Set cross arms at right angles to line for straight runs.
2. Set cross arms to bisect angle of turns in line direction.
3. Install two braces for each cross arm.

D. Install anchor rods, guy strands, and accessories.

E. Install [**ground rods**] [**butt plates**] and ground wire, as specified in Section 337900 - Site Grounding.

F. Identification:

1. Identify each pole using aluminum marker stamped with characters minimum 2.5 inches high.
2. Locate markers for maximum visibility and fasten with aluminum nails.
3. Obtain identifying characters from CHG&E.

3.3 FIELD QUALITY CONTROL

A. Field Test:

1. Minimum Quantity: One anchor of each capacity installed.
2. Capacity: Rated holding power.

END OF SECTION 267116

SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 GENERAL

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All work of Section 270526 - Grounding and Bonding for Communications Systems
2. All work of Section 270529 - Hangars and Supports for Communications Systems
3. All work of Section 270553 - Identification for Communications Systems
4. All work of Section 270800 - Commissioning of Communications
5. All work of Section 271116 - Communications Cabinets, Racks Frames and Enclosures
6. All work of Section 271119 - Communications Termination Blocks and Patch Panels
7. All work of Section 271123 - Communications Cable Management and Ladder Rack
8. All work of Section 271126 - Communications Rack Mounted Power Protection and Power Strips
9. All work of Section 271313 - Communication Copper Backbone Cabling
10. All work of Section 271323 - Communication Optical Fiber Backbone Cabling
11. All work of Section 271323.13 - Communications Optical Fiber Splicing and Terminations
12. All work of Section 271513 – Communications Copper Horizontal Cabling
13. All work of Section 271543 – Communications Faceplates and Connectors
14. All work of Section 271619 – Communications Patch Cords, Station Cords and Cross Connect Wire

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Not Applicable

1.3 PROJECT DESCRIPTION

A. This project consists of the installation of a complete structured cabling and infrastructure pathway system for a new buildout of Ulster County's PSAP and GOC. The project includes, but is not limited to the following:

1. Fitout of one (1) new Server Room and AV Room
2. Complete structured cable system CAT6A UTP to be furnished and installed on each floor
3. Structured cabling jacket shall be blue
4. Blue keystone jack color for County IT Services – IT, Security, Administration, non-mission critical – possible house count 0001-0009
5. White keystone jack color for DES cables to DES Row - 911, Vesta Lan and Motorola Dispatch, mission critical – possible house count 1001-9999
6. Yellow Keystone jack color for AV devices – Video Wall, Av devices, displays and advance audio – possible house count 2001-2999
7. Low Voltage installer to furnish and install locking server cabinets, with chimneys to plenum
8. Low Voltage Installer to install and connect the owner-furnished WAPs
9. Low Voltage Installer to furnish, install and test CAT6 shielded cable (for MOTOROLA)
10. Coax required for TVs as noted, coiled in AV rack
11. Coax required from the Vesta rack up to the roof for GPS. Protect with IP67 rated weatherhead.
12. "AV" Cabling to be terminated on separate series of patch panels in AV Cabinet 3
13. CAT6A Data to be terminated in the County IT Row in Rack 1
14. CAT6A Data to be terminated in the DES Row in Rack 1
15. Security device data to be terminated in Security Rack in County IT Row
16. Data to the large modular furniture will be terminated on a 12 port wall mounted patch panel within a compartment in the modular furniture system. Use jack color coding as described above.
17. All workstations receiving (2) shielded Motorola CAT6 STP cables and terminate at the desktop in a shielded modular male plug. Fish cable up through floorbox and through furniture to the desktop surface.
18. WAPs, clocks, Dynasigns, all terminate in County IT Row, Rack 1.
19. Security cameras, security card readers and security Intercoms cables terminate in the Security Rack in the County IT Row
20. Fiber from the Security Rack to the tower base housing - 12 strands, SM, LC tips, new LIU on each end.
21. Electricians responsible for ALL grounding and bonding
22. Cable Labeling convention to be discussed with owner before cabling for the project starts

1.4 SPECIAL CONDITIONS

A. The general conditions for contracts of construction, referred to in the contract documents as the General Conditions, together with the following articles of the Communications Structured Cabling Specifications, which amend, modify and supplement various articles and provisions of the General Conditions, are made part of the Contract and shall apply to all work under the Contract.

B. The Contractor represents that he/she is familiar with, and has expertise in the Work of this nature and scope. The Contractor further agrees that he/she shall provide all Work as may be required to make a complete job of that which may not be fully defined in the Contract documents.

C. These specifications are material, equipment, and performance specifications. Actual installation requirements shall be as indicated on the TN-series drawings. Installation details indicated on the drawings shall govern if they differ from the specifications. Contractor is obligated to identify such differences at the time of bid submission.

D. Contractor shall comply with all applicable governmental regulations and with all Federal, State, City, and other applicable codes and ordinances. If the contractor performs any work which is contrary to such regulations, codes, and ordinances, contractor shall make all changes to comply therewith and bear all costs arising there from.

E. It is the intent of this Specification that all items under these Sections be engineered, assembled, installed and maintained by, and under the full responsibility of a single Contractor, whether these processes are actually performed by the Contractor or not. Deviations from this intent are to be fully described in the proposal, with reasons for the same, and the coordination methods required facilitating the least effect of the deviation on the project's implementation.

1.5 WORK INCLUDED

A. The Owner seeks to identify a qualified telecommunications cabling contractor capable of performing the scope of work as identified in the Contract Documents.

B. It is the intent of these Specifications to create an ANSI/TIA-942-A-1 compliant cabling system to support high-speed data applications up to 100 Gbps including IEEE standards based on 1G, 10G, 40G, and 100 Gigabit Ethernet. System acceptance shall be judged on its ability to perform as such, the successful adherence to the installation instructions of this Specification, and compliance with parts and workmanship warranties.

C. The work covered by this specification includes the installation of a complete cabling system, including all labor necessary to perform and complete such installation, all materials and equipment incorporated or to be incorporated in such installation, and all services, supervision, consumable items, fees, licenses, facilities, tools, and equipment necessary or used to perform and complete such installation.

D. The Work Included is defined by the following and further defined in the drawings and Sections of Division 270500.

1. Provide project management and oversight for the installation of a complete structured cabling system.
2. Prepare and submit component documentation shop drawings, outlet labeling drawings, cable pull/termination schedules, cable test results and as-built drawings as described within this Specification and per the General Conditions.
3. Preparation of shop drawings, record or as-built drawings, manufacturer cut sheets, and other documentation described herein.

1.6 REFERENCES

A. Abbreviations and Acronyms

1.	A/E:	Architect / Engineer (designer)
2.	ANSI:	American National Standards Institute
3.	AHJ:	Authority Having Jurisdiction
4.	APC:	Angled Polished Connector
5.	BDF:	Building Distribution Frame
6.	BICSI:	Building Industry Consulting Service International
7.	CMP:	Communications Plenum cable
8.	CMR:	Communications Riser cable
9.	DAS:	Distributed Antenna System
10.	ELFEXT:	Equal Level ar End Cross Talk
11.	ER:	Equipment Room
12.	F/UTP:	Foil Screened Unshielded Twisted Pair
13.	FOTP:	Fiber Optic Test Procedure

14. GHz: Gigahertz
15. IDC: Insulation Displacement Conductor
16. IDF: Intermediate Distribution Frame
17. IT: Information Technology
18. ISP: Inside Plant
19. LC: A type of small form factor optical fiber connector
20. LOMMF: Laser Optimized Multimode Fiber
21. MDF: Main Distribution Frame
22. MHz: Megahertz
23. MMF: Multimode Fiber
24. MPO: Multi-fiber Push On connector
25. MPOE: Minimum Point of Entry
26. NEXT: Near End Cross Talk
27. OFNP: Optical Fiber nonconductive plenum cable
28. OFNR: Optical Fiber nonconductive riser cable
29. OSP: Outside Plant
30. OTDR: Optical Time Domain Reflectometer
31. PoE: Power-over-Ethernet
32. PSELFEXT: Power Sum Equal Level far End Cross Talk
33. PSNEXT: Power Sum Near End Cross Talk
34. RCDD: Registered Communications Distribution Designer
35. RMU: Rack Mount Unit
36. RoHS: Restriction of Hazardous Substances
37. ScTP: Screened Twisted Pair
38. STP: Shielded Twisted Pair
39. SMF: Singlemode Fiber
40. TBB: Telecommunications Bonding Backbone
41. TCIM: Telecommunication Cabling Installation Manual
42. TDMM: Telecommunications Distribution Methods Manual
43. TDR: Time Domain Reflectometer
44. TGB: Telecommunications Grounding Busbar
45. TIA: Telecommunications Industry Association
46. TMGB: Telecommunications Main Grounding Busbar
47. TR: Telecommunications Room
48. TSER: Telecommunications Service Entry Room
49. UL: Underwriters Laboratory
50. UTP: Unshielded Twisted Pair
51. WAP: Wireless Access Point

B. "PROVIDE" or "FURNISH" means to supply, purchase, transport, place, erect, connect, label, test and turn over to Owner, complete and ready for regular operation, all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for a telecommunications cabling system.

C. "SUPPLY" means to purchase, procure, acquire, and deliver complete with related accessories.

D. "INSTALL" means to move from property line, set in place, join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner of equipment and/or components. It means the installation is to be complete and ready for regular operation, except as otherwise noted.

E. "WIRING" or "CABLING" includes furnishing, unless otherwise noted, of all fittings, hangers, supports, sleeves, etc.

F. "CONDUIT" and CABLE TRAY" includes furnishing, unless otherwise noted, of all fittings, hangers, supports, sleeves, etc.

G. AS DIRECTED" means as instructed by the IT Project Manager or his representative.

H. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.

I. "EXPOSED" means not installed underground or "CONCEALED" as defined above.

J. "PERMANENT LINK" means the end-to-end test configuration for a link excluding test cords and patch cords, but including the mated connection with the link.

1.7 CODES, REGULATIONS, AND STANDARDS

A. All equipment shall be equal to or exceed the minimum requirements of OSHA, NEMA, IEEE, ASME, ANSI, NEC and Underwriters Laboratories.

B. The installation shall comply fully with all applicable local, county and state laws and ordinances, regulations and codes.

C. Local electrical and building codes in Philadelphia, Pennsylvania may be more stringent than national codes, recommendations or practice. Follow the most restrictive code or recommendations.

D. All products, services and materials provided and performed under the scope of this specification shall conform to the following codes and standards. Refer to the most recent version, update or addenda.

1. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual - latest edition
2. Building Industry Consulting Service International (BICSI) Information Transport Systems Installation Manual (ITSIM) – latest edition
3. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard
4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard
5. ANSI/TIA-569-C, Telecommunications Pathways and Spaces
6. ANSI/TIA-606-B, Administration Standard for Telecommunications Infrastructure
7. ANSI/TIA-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
8. ANSI/TIA-942-A, Telecommunications Infrastructure Standard for Data Centers
9. ANSI/TIA-455-57-B, FOTP-57, Preparation and Examination of Optical Fiber End Face for Testing Purposes
10. ANSI/TIA-455-78-B FOTP-78, Measurement Methods and Test Procedures – Attenuation
11. ANSI/TIA-455-95-A FOTP-95, Absolute Optical Power Testing for Optical Fiber and Cables
12. ANSI/TIA-455-133-A FOTP-133, Measurement Methods and Test Procedures – Length Measurement
13. ANSI/TIA-492AAAC-A, Detail specification for 850 nm Laser-Optimized, 50-μm Core Diameter/125-μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
14. ANSI/TIA-492CAAB, Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak
15. ANSI/TIA-526-7, OFSTP-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
16. ANSI/TIA-526-14-B, Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant

17. ANSI/TIA-758-B Customer Owned Outside plant Telecommunications Infrastructure Standard
18. FCC Part 15
19. FCC Part 68
20. IEEE 802.3-2012
21. IEEE 802.11, Wireless Ethernet Specifications, including 802.11a, 802.11b, 802.11g, 802.11n and 802.11ac.
22. NEC Article 392.5, Construction Specifications for Tray Modification
23. NEC Article 770, Optical Fiber Cables
24. NEC Article 800, Communications Circuits
25. NFPA 70, National Electrical Code
26. NFPA 75, Protection of Electronic Computer / Data Processing Equipment

1.8 QUALITY ASSURANCE

A. All materials furnished shall be new, unused, clean and free from damage, defects or corrosion.

B. Equipment and materials of the same type shall be a product of the same manufacturer throughout unless specifically exempted in advance. A specific example is all products comprising the Permanent Link (station cable, patch panels, jacks, faceplates, etc…)

C. Component manufacturer shall be ISO 9001:2008 and offer products that are RoHS compliant.

1.9 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Submit management and installation team reference documentation verifying that:
   a. The project manager is a RCDD in good standing with BICSI and is qualified to manage the scope of work described in the contract documents and has five (5) years of experience managing similar projects in size and scope. The documentation shall include the RCDD registration number.
   b. The field supervisor is a BICSI trained technician that is qualified to perform and oversee the work described in the contract documents.

B. Qualification Statements

1. The contractor shall submit documentation that within the past 12 months, a minimum of 75% of all installation personnel have been trained or certified by the manufacturer of the products they are installing.

C. Shop Drawings

1. Refer to requirements listed in Division 01.

1.10 COORDINATION OF WORK

1. Refer to requirements listed in Division 01.

1.11 CLOSEOUT SUBMITTALS

A. Subsequent to the installation and prior to acceptance of the work, the contractor shall prepare and issue record (as-built) drawings, in AutoCAD format, that reflect the lengths of cables installed, the actual manner and conditions of installation, including all deletions from, additions to or departures from the contract documents. These documents are to include all specified labeling and pathway routing detail. Pathway routing detail shall be provided in excel format for importation into Owner database. Identifiers used to label cables and components as specified in Section 270553 shall be used in identifying cables and components in record drawings.

B. Provide revised cable termination schedules for all cables installed under the Work. Format to comply with owner system requirements. Schedules shall be in printed form and on either CD or DVD in Microsoft Excel format. Identifiers used to label cables as specified in Section 270553 shall be used in identifying cables in cable termination schedules.

C. Provide two (2) sets of Operation and Maintenance Manuals including wiring diagrams, parts list, shop drawings and manufacturers' information on all equipment and cables provided under this Work. Provide manuals in a high quality, 3-ring binder, completely indexed. Provide manuals within fifteen days of systems acceptance

D. Provide two (2) sets of all cable test results in the native format of the test equipment vendor and in excel format on CD or DVD. Identifiers used to label cables as specified in Section 270553 shall be used in identifying cables in cable test results

1.12 MANUFACTURER'S EXTENDED WARRANTIES

A. All manufacturer extended product warranties shall be afforded to The Owner. A copy of certification by the manufacturer for all products listed in this specification is to be provided.

B. Prior to commencement of the work, the successful bidder shall contact an authorized manufacturer's representative to inform them that this job is being registered under the warranty program. Bidder shall provide an additional copy of all warranty notifications to owner.

C. Upon completion of the work, the contractor shall coordinate with the manufacturer the issuance of a full warranty on the entire copper and fiber optic cable plant for both parts and labor. The cabling contractor at his sole expense will correct any deficiencies determined by the manufacturer to be installation related.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Refer to the specific sections of the specifications for equipment requirements.

PART 3 - EXECUTION

3.1 STAFFING

A. Craft personnel shall be certified personnel qualified to perform the work and be knowledgeable of the following activities included but not limited to:

1. Color coding of standard American telephone/ data telecommunications cables.
2. Bonding and grounding of telecommunications systems
3. Testing conductors for transmission impairments.
4. Testing conductor insulation.
5. Installation and termination of optical fiber cabling.
6. Testing and verification of optical fiber transmission characteristics with a power meter.
7. Telephone and data industry cable installation standards and manufacturer's instructions will be used for in-process quality control and final acceptance of the work installation.
8. Cable tray and ladder rack installation.

B. Craft personnel will be required to provide and use the proper tools and test equipment in the performance of each activity. The tools must be in good working order, and the test equipment must have current calibration certificates, as applicable. The Owner reserves the right to review the tool and test equipment lists and maintenance procedures of the contractor.

C. Use of Site – Refer to the Division 01 Requirements.

D. Follow manufacturer's instructions for installing, connecting, and adjusting all telecommunications cabling and associated supporting, termination and splicing equipment, conduits, poke throughs, and cable tray. Provide a copy of such instructions at the equipment during any work on the equipment.

E. Keep all items protected before and after installation. Provide protection for exposed cables roughed onto the floor prior to their installation into the furniture systems. Clean up and remove all debris.

F. If products and materials are specified herein for a specific item or system, use those products or materials. If products and materials are not listed, use first-class products and materials, subject to acceptance of shop drawings.

G. Examine and compare the telecommunications cabling drawings and specifications with the drawings and specifications of other trades; report any discrepancies between them to the IT Project Manager; and obtain from him written instructions for changes necessary in the work.

H. The locations of structural and architectural features, sleeves, floor slots, termination and cross connect fields, panels, racks and other equipment indicated on the drawings are approximate. The contractor shall verify the existence, locations, and suitability of all such items, and shall present, with bid response, required modifications to contract documents necessary to complete this work.

3.2 SPECIAL CONDITIONS

A. Furnish, install, terminate and test all riser & tie cabling shown in the attached and associated drawings and described below.

1. The contractor shall route all copper and fiber cabling, unless otherwise identified, via overhead cable tray, ladder rack, conduits, raised floors, and poke-throughs unless otherwise noted

2. Cables with the same origin and destination shall take diverse paths. Diverse path is defined as paths that do not intersect and remain at least 3 feet apart along the entire route
3. All cables shall be dressed in a neat manner, observing cable bend radius limit at each rack, frame and cabinet, and on ladder racks and cable trays.
4. Overhead cabling shall follow ladder rack tray system. Utilize cable waterfall for exiting ladder rack at frames and cabinets.
5. Provide Velcro cable ties at five-foot intervals for each cable bundle.
6. Cables must be securely bundled, but may not display insulation/sheath damage or pair distortion from over-tightening of Velcro cable ties
7. Cabling at racks and frames must be neatly dressed and Velcro tie wrapped.

3.3 INSTALLATION

A. General

1. Subcontractor will provide paired copper, coaxial, and optical fiber backbone and horizontal cabling as noted on Drawings and Schedules.

B. Contractor shall take all necessary precautions to assure that the maximum tensile load and minimum bend radius of all cables (fiber and copper) are not exceeded. When terminating UTP cable, the contractor must maintain pair twists up to the termination point and the cable sheath shall not be removed more than 0.5" from the termination point. Velcro tie wraps are to be hand tightened on cables to prevent crimping cable sheath. Plastic tie wraps are not to be used on lateral cables. All tie wraps need to be cut so that no edges are visible that can cause potential damage to the cable bundle. The contractor is responsible for protecting all connectorized cables from damage by other contractors at the information outlet before and after installation of the outlet faceplates.

C. Termination Hardware.

1. All copper and fiber cabling will be terminated on rack and cabinet mounted patch panels. The fiber optic tie cabling shall be terminated on fiber distribution coupler panels with LC connectors. All termination hardware shall be grounded and bonded according to applicable codes, TIA standards, and Section 270526.

D. Fire Stop - Penetration Sealant: Refer to work of other sections

3.4 REPLACEMENT

A. Any fiber strand, connector, block, or module installed by the contractor, which fails to meet the loss budget or tests below the manufacturer's standards, shall be replaced at no additional cost to the Owner. The replacement cable, connector, or part shall be tested after repairs have been made to verify compliance. Only equipment that meets the installation requirements stated herein shall meet The Owner's acceptance requirements.

3.5 SOURCE MANUFACTURING AND QUALITY CONTROL

A. Cables that are supplied by the contractor, and test outside of the factory test data by a margin of 10 percent on loss, may, at The Owner's option, be deemed non-usable and returned to the manufacturer for replacement.

3.6 POST IMPLEMENTATION TESTING

A. Following the physical installation of the cabling, the contractor will conduct pre-checkout tests as described below, "Physical Inspection", prior to the formal acceptance tests with The Owner.

3.7 PHYSICAL INSPECTION

A. Prior to conducting any transmission testing, the following visual inspections will be performed:

1. Verify that all cable has been installed to full compliance with the proposal specifications.
2. Check for physical damage to the optical fiber distribution panels and termination hardware.
3. Check that all cabling is properly jacketed, installation properly labeled at both ends of the cable, innerduct and termination hardware is completed.
4. Verify that all cable bends are within the manufacturer's specified bend radius
5. Verify that all cabinets and racks (which require grounding) are properly grounded and comply with the National and Local Electrical Codes for grounding
6. Verify that the cables are properly approved and structurally supported for termination
7. Verify that the requirements of all authorities having jurisdiction have been satisfied.

END OF SECTION 270500

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Non-continuous cable supports.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
2. Section 271123 – Communications Cable Management and Ladder Rack
3. Section 271513 – Communications Copper Horizontal Cabling

1.3 SUMMARY

A. Provides specifications for non-continuous cable support components utilized to provide pathways support to telecommunications cables traveling outside cable trays, conduits, or other continuous cable supports.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 NON-CONTINUOUS CABLE SUPPORTS

A. Manufacturer List:

1. Erico – Caddy CableCat support system
2. Cooper B-Line – Spring steel fasteners
3. Panduit – J-Mod cable support system
4. Or approved equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.
2. Select support system components capable of supporting the telecommunications cable quantities required for each location. Options are as follows:
   a. Support slings/cable straps – CADDY "Cablecat" Part No. CAT425 or approved equivalent
   b. Four (4) inch wide J-hook supports – CADDY "Cablecat" widebase cable support J-hooks, Part No. Cat64 or approved equivalent.

C. Description:

1. Non-continuous cable supports shall be available in multiple sizes, styles and materials. Rigid supports shall be equipped with flared edges and pre-configured bend radius controls.
2. Provide drop wire supports and threaded rod assemblies in areas where structural mounting surfaces are non-functional or inaccessible.
3. Sling assemblies/cable straps shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance UTP cables. Support slings shall have a static load limit of 100 lbs.
4. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable.
5. Select approved non-continuous cable supports suitable for specific installation environments and/or air handling (plenum) spaces.

2.2 CONTINUOUS UNDERFLOOR CABLE SUPPORTS

A. Manufacturer List

1. Hubbell
2. LeGrand
3. Panduit
4. Or approved equivalent

B. Product Options:

1. Underfloor Wire-mesh cable trays are the support system for the infrastructure. All pathways shall conform to the TIA-569 Commercial Building Standard for Pathways and Spaces. Infrastructure Support Systems include, but may not be limited to, the following:

2. Wire Mesh cable trays
3. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.
4. Wire-mesh cable tray routes shown on the project drawings are indicative of the design intent and desired routing. The Contractor is responsible for detailed routing within the facility and shall coordinate the detailed routing with the Owner.
5. Select support system components capable of supporting the telecommunications cable quantities required for each location. Options are as follows:
   a. Underfloor basket tray – Hubbell part number HBTU041248 as an example
   b. Underfloor basket tray – LeGrand Model # CF105 as an example

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 NON-CONTINUOUS CABLE SUPPORT INSTALLATION

A. Process:

1. Follow manufacturer's instructions and recommended industry standards and guidelines.
2. The installed non-continuous support system must be an independent support structure for the voice/data communication system.
3. Draping cables over other structures in the ceiling is unacceptable. Water pipes, ceiling grid, sprinkler system, electrical supports, air ducts or any other in-ceiling structure may not be used for cable support.
4. Contractor installed supports shall be used to supplement the main cable support system when any cabling leaves the main support system or is unsupported for more than three and one half feet (3'-6").
5. Supports shall be installed at a maximum distance of 5'-0"apart.
6. Non-continuous supports shall be installed with ceiling wire or threaded rod secured to the slab above to support the telecommunications cable infrastructure parallel to the slab throughout the cable plant, unless site conditions dictate a non-parallel installation.
7. Cable must be routed to follow existing corridors and parallel or 90 degree angles from all walls and the cable tray whenever possible.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 270529

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. NAMING CONVENTION TO BE DISCUSSED WITH OWNER BEFORE CABLING IS LABELED

1. In the Data Center, there are multiple termination locations:
   a. DES 911data patch panels
   b. IT data patch panels
   c. VESTA shielded patch panels
   d. Motorola shielded patch panels
   e. AV data patch panels
   f. Security data patch panels
   g. Large modular PSAP workstations have a 12 port, wall mounted patch panel within
      1) With multiple server room data locations, labeling needs to be very clear. A meeting prior to cable pulling will be required with owner to determine cable labeling.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Labeling and identification products

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
2. Section 271119 – Communications Termination Blocks and Patch Panels
3. Section 271513 – Communications Copper Horizontal Cabling
4. Section 271533 - Communications Coaxial Horizontal Cable

1.3 SUMMARY

A. Provides specifications information for identification of the various components of the telecommunications infrastructure and pathway system.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 LABELING AND IDENTIFICATION PRODUCTS

A. Manufacturer List:

1. Brady USA Inc.
2. Panduit Corporation
3. Rhino
4. Ortronics
5. Or approved equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular requirements for each situation.

C. Description:

1. Machine-generated, printed self-adhesive, smudge resistant labels for cables, faceplates, patch panels, and termination blocks. Labels shall be appropriately sized for cable diameter. Labels shall be appropriately colored for faceplate color contrast
2. The intention of the labeling scheme is to be ANSI/TIA-606-B compliant.
3. It is the responsibility of the contractor to acquire, understand, and utilize the owner's labeling scheme for all components of the communications system.
4. Submit sample labels for approval.
5. Labels shall have industrial adhesives that resist dirt and oil.
6. Shall have a split backing for easy removal
7. Design Make
   a. Flexible Nylon
      i. For curved surfaces (wire and cable) and rough surfaces for indoor applications flexible nylon memory resistant material shall be used.
   b. Permanent Polyester Labels
      i. For flat surfaces permanent polyester shall be used.
   c. Vinyl
      i. For outdoor applications in direct sunlight and where color coding is required vinyl shall be used.

d. Heat Shrink Tube
    i. Shall be polyolefin tube with a 3:1 heat-shrink ratio
e. Non – Adhesive labels
    i. Shall be rigid and durable polypropylene material.

8. Labeling shall meet the visibility and durability requirements of ANSI/TIA – 606-B standard.
9. Labels shall be pre-printed or laser-printed. Hand written labels are not acceptable.
10. Labels shall have white printing area and black print. If cable jacket is white, provide cable label with printing area that is any color other than white, preferably orange or yellow – so that labels are easily distinguishable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 LABELING

A. Process:

1. The Owner-approved labeling scheme is intended to comply with the ANSI/TIA-606-B standard for labeling and administration of a cable plant. It is the responsibility of the contractor to acquire, understand, and utilize the owner's labeling scheme for all component of the voice data communications system including, but not limited to:
    a. Station cables (both ends)
    b. Backbone (riser) cables (both ends and at 25-foot intervals of exposed cable run)
    c. Workstation outlet faceplates and individual outlet connectors
    d. Termination panels, blocks, trays
    e. Telecom Room entry and exit pathways
    f. Racks, cabinets, and equipment
    g. Telecommunication cable tray and conduit pathways
2. Label each component with a machine-generated label where it is accessible for administration.
3. Provide on all outlet faceplates installed under this Work machine-generated labels with the outlet ID clearly printed, in uppercase lettering. Label shall be of a contrasting color to the faceplate color.
4. Provide on all termination blocks installed under this Work, machine-generated designation strips with the cable ID clearly printed and pair number, in uppercase lettering.
5. Provide on all patch panels installed under this Work, machine-generated label with the cable ID and port number clearly printed in uppercase lettering. Each panel shall have a unique identification label as well.
6. Provide on all cables installed under this work, machine-generated labels with the cable ID clearly printed, in black uppercase lettering on a permanent adhesive, white label stock, covered with a permanent water resistant sealer. Labels shall be placed on both ends of each cable at no more than 6-inches from the point at which the cable is broken out into individual copper pairs or strands from the connector or termination block or patch panel.
7. Provide on all equipment racks/cabinets installed under this work, phenolic nameplate labels in white uppercase lettering on black background.
8. Provide all labels in accordance with Owner's labeling standards and in accordance with the approved cable termination schedule.
9. Hand lettered label stock will not be accepted for final installation. Hand lettered stock is acceptable only for temporary labeling required during construction phases.

10. All cable IDs shall be both physically and visually accessible upon completion of the project. Label locations shall be such that all labels can be easily seen and read without disassembling cable bundles or stressing cable connections in order to gain visual access.
11. If at any time during the project, any label becomes illegible, is removed, or is found to be positioned so that it will not be easily readable when cable termination and dressing are completed, the Contractor shall immediately replace it with a duplicate preprinted label.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings required prior to acceptance by the Owner.

END OF SECTION 270553

SECTION 270800 – COMMISSIONING OF COMMUNICATIONS SYSTEMS

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Copper cable test device
2. Optical fiber cable test device
3. Cable Test Results
4. As-built drawings

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Sections include the following:

1. 271119 – Communications Termination Blocks and Patch Panels
2. 271313 – Communications Copper Backbone Cabling
3. 271323 – Communications Optical Fiber Backbone Cabling
4. 271513 – Communications Copper Horizontal Cabling
5. 271543 – Communications Faceplates and Connectors
6. 271619 – Communications Patch Cords, Station Cords, and Cross Connect Wire

1.3 SUMMARY

A. Provides specifications for a certification tester used for end to end testing, certification, and documentation of all test results to confirm the installed connectivity system complies with industry standards and specific category and performance ratings.

B. Contractor to notify owner three (3) days prior to testing any cabling.

1.4 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 COPPER CABLE TEST DEVICE

A. Manufacturer List:

1. Fluke Networks

B. Product Options: Select analyzer to comprehensively certify each category rated connection and record results verifying compliance with TIA performance specifications to meet the category rating of the system.

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.
2. Select analyzer to comprehensively certify each category rated connection and record results verifying compliance with TIA/EIA performance specifications to meet the category rating of the system.
3. Fluke Networks Cable Analyzer

C. Description:

1. Must meet or exceed ISO Level IV and TIA Level III compliant network cable-testing device certification by an independent laboratory, such as Intertek, for verification of high speed, ANSI/TIA- T568-C compliant cables.
2. Copper test equipment must be capable of certifying ANSI/TIA-568-C Category-3, 5e, 6, and 6A UTP/ScTP UTP/ScTP/FTP links or channels independent of termination hardware configuration (RJ45 port or 110-style) for each level of performance.
3. Provide bi-directional autotest certification of Category-3, 5e, 6, and 6A balanced twisted pair cabling
4. All test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:

1. Interface Adapters
   a. TIA Category-3, 5e and 6A: 100 ohm
   b. Category/Class E permanent link adapters for TIA Cat 3, 5e and 6A unshielded and shielded cables.
   c. Fluke Networks DTX ten (10) Gigabit Kit - DTX 10 Gig over Copper Test solution, Model No. DTX-10GKIT or approved equivalent.

2.2 OPTICAL FIBER CABLE TEST DEVICE

A. Manufacturer List:

1. Fluke Networks

B. Product Options:

1. Select analyzer to comprehensively certify each optical fiber connection and record results verifying compliance with TIA performance standards and manufacturer specifications.

a. DTX Cable Analyzer,
b. Certifiber Pro Optical Loss Test Set
c. OTDR

C. Description:

1. The optical fiber source shall permit full end to end testing of Multimode, Single-mode and LOMMF optical fiber cabling fully compliant with industry standards and manufacturer recommendations.
2. Available source types and wavelengths shall be as follows:
   a. Multimode - 850nm LED and 1300nm LED.
   b. Single-mode – 1310nm FP Laser and 1550nm FP Laser.
   c. LOMMF – 850nm VCSEL and 1310nm FP Laser.

3. The power meter shall be calibrated to read 850, 1300, 1310 and 1550nm wavelengths.

D. Accessory Products: -

1. Fiber Microscope
   a. Magnification of 200X or 400X for endface inspection
   b. Optional requirements
      i. Video camera systems are preferred.
      ii. Camera probe tips that permit inspection through adapters are preferred
      iii. It is preferable to use test equipment capable of saving and reporting the endface image.
   c. FiberInspector Mini Video Microscope – Model No. FT500

PART 3 - EXECUTION

3.1 EXAMINATIONS

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

B. Verify telecommunications cabling is installed and supported, terminated, mounted in an appropriate housing or terminated on the applicable component and labeled prior to certification testing and documentation.

C. Verify certification tester universal interface adapters and manufacturer patch cords that enable permanent link verification are in new condition not indicating any twisting or kinking resulting from incorrect storage of the tester interface adapters.

D. Optical fiber patch cords shall be inspected to ensure connector surfaces are clean and free of defects that may affect testing results.

3.2 COPPER CABLE TESTING GENERAL REQUIREMENTS

A. Process:

1. Certification test 100% of the installed cabling plant including all backbone and horizontal four (4) pair UTP/ or F/UTP copper connections.
2. Follow manufacturers' instructions and recommended industry standards and guidelines to complete all TIA testing procedures to verify performance levels.
3. Follow manufacturer requirements for self-calibration procedures.
4. Perform all tests required by local authorities in addition to tests specified herein.
5. Update tester software to show specific project information including but not limited to:

    a. Date and time of testing
    b. Project name
    c. Field technicians name
    d. Cable identification number
    e. Cable manufacturer, type and part number

3.3 CATEGORY 6A F/UTP COPPER CABLE TESTING REQUIREMENTS

A. General Requirements

1. Every cabling link in the installation shall be tested for:

    a. Wire Map
    b. Length
    c. Insertion Loss
    d. NEXT Loss
    e. PS NEXT Loss
    f. ACR-F Loss
    g. PS ACR-F Loss
    h. Return Loss
    i. Propagation Delay
    j. Delay Skew

in accordance with the field test specifications defined in ANSI/TIA-568-C.2 "Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard". This document will be referred to as the "TIA Cat 6A Standard."

2. The installed twisted-pair horizontal links shall be tested from the IDF in the telecommunications room to the telecommunication wall outlet in the work area for compliance with the "*Permanent Link*" performance specification as defined in the Category 6A Standard.
3. One hundred percent of the installed cabling links must pass the requirements of the Category 6A Standard mentioned in A.1 above and as further detailed in Section B. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section C below.
4. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).
5. The test equipment (tester) shall comply with the accuracy requirements for level III field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test

configuration (baseline accuracy *plus* adapter contribution) are specified in Table 3 of ANSI/TIA-1152 (Table 3 in this TIA document also specifies the accuracy requirements for the Channel configuration).

6. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
7. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
8. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
9. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
10. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.
11. A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.
12. A representative of the end-user has the right (at their discretion) to select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Section C.1. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

B. Performance Test Parameters

The test parameters for Category 6A cabling are defined in the ANSI/TIA-568-C.2 and are all tested automatically using the Category 6A Autotest with the Fluke DTX-1800 or Fluke DSX-5000 CableAnalyzer.

C. Test Result Documentation

1. The test results/measurements shall be transferred into a Windows™-Excel and in the Fluke LinkWare Cable Test Management Software format. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.
3. General Information to be provided in the electronic database with the test results information for each link:

a. The identification of the customer site as specified by the end-user
b. The identification of the link in accordance with the naming convention defined in the overall system documentation
c. The overall Pass/Fail evaluation of the link-under-test
d. The name of the test limit selected to execute the stored test results
e. The cable type and the value of NVP used for length calculations
f. The date and time the test results were saved in the memory of the tester
g. The brand name, model and serial number of the tester
h. The identification of the tester interface
i. The revision of the tester software and the revision of the test standards database in the tester
j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.

4. The detailed test results data to be provided in the electronic database for must contain the following information:
For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.

a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m (1) and the test limit value
b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value
c. Delay Skew: Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value
d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair
e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link
f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link
g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link

(1): Nominal Velocity of Propagation (NVP) expresses the speed of the electrical signals along the cabling link in relation to the speed of light in vacuum ($3x10^8$ m/second). Insulation characteristics and twist rate of the wire pair influence NVP in minor ways. Typically, an 'average' value for NVP is published for all four wire-pairs in a data cable.

(2): 'Margin' designates the difference between the measured value and the corresponding test limit value. For passing links, 'worst case margin' identifies the smallest margin over the entire frequency range; the point at which the measured performance is "closest" to the test limit.

3.4 FIBER OPTIC CABLE TESTING REQUIREMENTS

A. GENERAL

1. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
2. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

B. OPTICAL FIBER CABLE TESTING

1. Field-test instruments shall have the latest software and firmware installed.
2. Link and channel test results from the OLTS shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
3. Fiber endfaces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
   a. It is preferable that the endface images be recorded in the memory of the test instrument for subsequent uploading to a PC and reporting.

4. Testing shall be performed on each cabling segment (connector to connector).
5. Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.
6. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length.
7. Optical loss testing
   a. Backbone link
      iv. Multimode (OM4) backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI /TIA-526-14-B, One-cord reference method (Annex A)
      v. Singlemode (OS2) backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI /TIA-526-7, Method A.1,, Insertion Loss Using An Optical Power Meter – One Jumper Cable Measurement.
      vi. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
      vii. Use the One Reference Jumper Method specified by ANSI/TIA -526-14-B, Annex A and and ANSI/TIA -526-7, Method A.1. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

8. Magnified Endface Inspection
   a. Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers.

9. Length Measurement
   a. The length of each fiber shall be recorded.
   b. It is preferable that the optical length be measured using an OLTS.

10. Polarity Testing
    a. Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA 568 C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

C. ADMINISTRATION

1. Test results documentation
   a. Test results saved within the field-test instrument shall be transferred into a Windows™-Excel and in the Fluke LinkWare Cable Test Management Software format. These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument". The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
   b. The test results documentation shall be available for inspection by the Owner or the Owner's representative during the installation period and shall be passed to the Owner's representative within 5 working days of completion of tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as built information.
   c. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD-ROM prior to Owner acceptance of the building. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.
   d. Circuit IDs reported by the test instrument should match the specified label ID.
   e. The detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information
      i. The identification of the customer site as specified by the end-user
      ii. The name of the test limit selected to execute the stored test results
      iii. The name of the personnel performing the test
      iv. The date and time the test results were saved in the memory of the tester
      v. The manufacturer, model and serial number of the field-test instrument
      vi. The version of the test software and the version of the test limit database held within the test instrument
      vii. The fiber identification number
      viii. The length for each optical fiber (Optionally the index of refraction used for length calculation when using a length capable OLTS)
      ix. Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
      x. The overall Pass/Fail evaluation of the link-under-test for OLTS measurements
      xi. A picture or image of each fiber end-face and a pass/fail status of the end-face based upon visual inspection.

3.5 ACCEPTANCE OF TEST RESULTS

A. Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in compliance with the following test limits:

1. Optical loss testing
   a. Multimode and Singlemode links
      i. The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.
         a) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
         b) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
         c) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
         d) Maximum allowable connector_loss = 0.50 dB
         e) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
         f) Maximum allowable splice_loss = 0.3 dB
         g) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Multimode 50/125 µm	850	3.5	1300	1.5
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

2. Magnified endface inspection
   a. Fiber connections shall be visually inspected for endface quality.
   b. Scratched, pitted or dirty connectors shall be diagnosed and corrected.

B. All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Section 3.4. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with Section 3.4.

C. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

Note: High Bandwidth applications such as 1000BASE-SX, 10GBASE-SR, and 40GBASE-SR4 impose stringent channel loss limits. Where practical, certification should consider loss length limits that meet maximum channel (transmitter to receiver) loss.

Performance specification for MM fiber at 850 nm

Fiber Type		Bandwidth	1000BASE-SX		10GBASE-SR		40GBASE-SR4	
	µm	(MHz• Km)	Length (m)	Loss (dB)	Length (m)	Loss (dB)	Length (m)	Loss (dB)
OM1	62.5	200	275	2.38	33	2.5		2.4
OM2	50	500	550	3.56	82	2.3		2.2
OM3	50	1500		3.56	300	2.6	100	1.9
OM4	50	3500			400	2.9	150	1.5

3.6 REPAIR

A. Any connections failing to meet referenced standards or more stringent performance requirements stated above, must be removed and replaced with connections that prove, in additional testing, to meet or exceed the performance standards set forth.

3.7 RE-INSTALLATION

3.8 No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.closeout activities

A. Contractor to submit all test results and any test documentation required prior to acceptance by the Owner.

B. Record copy and as-built drawings

C. Provide record copy drawings periodically throughout the project as requested by the Construction Manager or Owner, and at end of the project on CD-ROM or DVD. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination point. CAD drawings are to incorporate test data imported from the test instruments.

D. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:

1. Field directed changes to pull schedule.
2. Field directed changes to cross connect and patching schedule.
3. Backbone cable routing or location changes.
4. Associated detail drawings.

END OF SECTION 270800

SECTION 271116 – COMMUNICATIONS CABINETS, RACKS, FRAMES, & ENCLOSURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Equipment Frames

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270526 – Grounding and Bonding for Communications Systems
2. Section 270529 – Hangers and Supports for Communications Systems
3. Section 270553 – Identification For Communications Systems
4. Section 271119 – Communications Termination Blocks and Patch Panels

1.3 SUMMARY

A. Provides specifications for equipment racks, and telecommunications enclosure components utilized to house various telecommunications infrastructure components within technology distribution spaces.

1.4 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 EQUIPMENT CABINETS

A. Manufacturer List:

1. Chatsworth Products Inc. (CPI) Zeta frame
2. Belden XS Series
3. Or approved equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each infrastructure component selected shall address the particular requirements.
2. Select relay racks and components capable of supporting the telecommunications cable and equipment quantities required for each location.
3. Cabinet system must have a chimney option for cooling – raised access floor data center so both chimney and bottom panel required – perforated front door required
4. Equivalents are accepted.

C. Description:

1. Cabinets shall be used for mounting of patch panels, wire management, and network equipment in the Telecom Rooms.
2. Cabinets shall be of high strength aluminum construction.
3. Minimum weight capacity of 3,000 lbs.
4. Cabinets shall be 84 inch (2286 mm) high, 3 inch (152 mm) channel depth and 19 inch (482 mm) mountable with standard EIA-310-D hole spacing, and 42" deep. Cabinets shall contain mounting dimension of a minimum of forty-eight (48) rack units marked in a contrasting color.
5. Cabinets shall be bolted to slab at front and rear flanges and tied to overhead ladder rack for additional stability with threaded rod and Kindorf or the appropriate ladder rack mounting hardware.
6. Cabinets shall be provided with equipment mounting screws (50 per rack minimum).
7. Cabinets finish shall be white
8. Cabinets shall be furnished with (2) vertical wire managers
9. Cabinets shall have a bottom panel with knockouts for data cabling – raised access floor in server room serves both to cool the room and run data cabling
10. Accessory mounting brackets to accept mounting of two (2) vertical plug strips.
11. Grounding accessories as required to bond all removable rack parts to grounding system. Cabinets shall be equipped with a vertical Rack Grounding Busbar (RGB) bonded with a #6 AWG wire with green insulation to the nearest Telecom Grounding Busbar (TGB). Use lug type connectors at each end. (CHECK WITH ELECTRICIAN AS THEY ARE GROUNDING THE ROOM)
12. Cabinet doors must have locking mechanism, both front and back doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or

use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
3. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 EQUIPMENT FRAMES

A. Process:

1. Install all frames & cabinets per the manufacturer's recommended instructions.
2. Furnish and install equipment frames & cabinets in each location as shown on the drawings, for the mounting of cable and Owner provided equipment~~. Bond the racks and cabinets to the telecommunications grounding bus bar in the room with # 6 AWG wire as specified in ANSI/TIA-607-B.~~
3. Anchor all racks and frames to the raised floor / slab and cross brace to structure above.
4. Bolt all cabinets to each other in each row. Furnish and install end panels at both ends of each row. Bolting cabinets to each other will follow manufacturer's recommended procedures using manufacturer-approved hardware (clips, nuts, bolts, washers, etc.)
5. Seismically brace the products indicated in this specification adhering to construction regulations relative to the buildings seismic zone.
6. Contractor shall request written authorization prior to drilling into any surface more than one and one half inch (1.5") in depth
7. Racks for installation only shall include as part of the contractor's preparation and staging work a visual inspection for missing or damaged material including accessories and power strips. Any irregularities shall be documented and submitted for verification to the Owner and A/E team.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the owner.

END OF SECTION 271116

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 271119 – COMMUNICATIONS TERMINATION BLOCKS & PATCH PANELS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Optical Fiber Termination Shelves
2. Copper Patch Panels

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270553 – Identification for Communications Systems
2. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
3. Section 271313 – Communications Copper Backbone/Tie Cabling
4. Section 271323 – Communications Optical Fiber Backbone/Tie Cabling
5. Section 271513 – Communications Copper Horizontal Cabling

1.3 SUMMARY

A. Provides specifications for wall and rack/cabinet-mounted blocks, patch bays, and patch panel components utilized to terminate various telecommunications infrastructure cabling and connectivity.

1.4 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 OPTICAL FIBER TERMINATION SHELVES

A. Manufacturer List:

1. Corning
2. CommScope
3. Belden
4. Or Equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Suitable for mounting in standard EIA 19-inch racks. Each patch panel with quick release hinged front door, hinged rear door, slide out shelf, front facing label panel. Complete with coupler panels and couplers.
2. Each panel shall offer one or more of the following strain relief options: compression glands, or internal clips and entrapment of yarn based impact resistance
3. Each patch panel shall be able to handle a minimum (48) terminated elements in a (1) RMS footprint, including a 24-inch service loop in each fiber element inside the enclosure. The bulkhead adapters are to be segregated in such a way that it will be clear which coupler belongs to each fiber type.
4. Cable Management rings or guides shall be provided to allow individual elements to be stored in the panel without crushing, bending or straining each element.
5. Each panel shall be able to store fiber reserve within the parameter/requirement of the fiber cable manufacturer for minimum bending radius.
6. There shall be sufficient finger space around bulkhead adapters to allow connectors to be mounted and demounted readily.
7. Each patch panel shall be fitted with bulkhead adapters with ceramic alignment sleeves for all styles of connectors. Bulkhead adapters to be sourced from the same manufacturer as the connectors provided as a part of this project, or they are to be recommended by the manufacturer for use with the connector.
8. Panels shall accommodate Plug & Play MPO modules in addition to bulkhead adapters.
9. Panels shall accommodate splice trays as required.
10. Panels shall be sized as indicated on drawings.
11. Used for housing fiber optic cables in the Server Room if necessary

D. Accessory Products:

1. Provide any accessory products related to the optical fiber termination shelves to provide a complete and functional infrastructure system.

2.2 COPPER PATCH PANELS – STATION CABLES (12 PORT PATCH PANELS TO BE USED IN PSAP STATIONS INSIDE PC CABINET IN FURNITURE)

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemens
4. Or equivalent

B. Product Options:

1. The indicated or equivalent manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Modular RJ45 jack panels. (SHIELDED FOR VESTA AND MOTOROLA CABLES)
2. Flat style panels.
3. Panel finish shall be black.
4. Able to meet or exceed the channel specifications of the ANSI/TIA/EIA-568-C.2-10 standard for a Category 6A system up to 500 MHz.
5. EIA/TIA T568B wiring scheme.
6. Suitable for mounting in standard EIA 19-inch racks.
7. Provided with a minimum of 48 connectors, as defined in this specification, housed in 2 RMU of usable rack height.
8. Strain relief for each cable terminated on the connector. Provide strain relief bars on the rear of all panels.
9. Store cable reserve with no bends sharper than a 2-inch (50 mm) bend radius.
10. Provide sufficient finger space to allow connectors to be mounted and demounted readily.
11. Space for labeling of each individual connector.
12. Shall allow any individual cable to be terminated or otherwise handled without disturbing other cables.
13. Complete with designation strips
14. Used for workstation cabling terminations as indicated on drawings.

D. Accessory Products:

1. Provide any accessory products related to the patch panels to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)

2. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
3. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 OPTICAL FIBER TERMINATION SHELVES, COPPER PATCH PANELS

A. Process:

1. Install patch panels for the termination of all copper cables installed under this work. Mount the patch panels into the equipment racks as shown in the drawings. Provide patch panels complete with designation strips.
2. Provide optical fiber patch panels as shown on the drawings for the termination of optical fiber cables installed under this work. Provide patch panels complete with coupler panels, coupler modules, and cable designation strips.
3. Provide horizontal wire management panels between flat patch panels installed in each equipment rack and cabinets; angled patch panels do not require horizontal wire management panels.
4. Install all optical fiber and UTP components under the guidelines of the manufacturer's recommended instructions and per all TIA 568C standards and manufacturer-approved industry practices as shown in the T-series drawings.
5. The installation and performance parameters of all installed cable termination panels shall be verified by the contractor through TIA 568C testing procedures.
6. Label all cable termination panels to identify each port and each specific panel in accordance with the TIA-606-B labeling scheme approved by the Owner.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the owner.

END OF SECTION 271119

SECTION 271123 – COMMUNICATIONS CABLE MANAGEMENT & LADDER RACK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Overhead Ladder Rack

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
2. Section 271119 – Communications Termination Blocks and Patch Panels
3. Section 271513 – Communications Copper Horizontal Cabling

1.3 SUMMARY

A. Provides specifications for cable management components utilized inside each telecommunications distribution space to support the management of horizontal workstation cabling, backbone cabling, and patch cords.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 LADDER RACK (ABOVE THE CEILING AND IN DATA CENTER)

A. Manufacturer List:

1. Cablofil
2. Cooper B-Line
3. Monosystems, Inc
4. Panduit

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Open rung TELCO-style ladder type cable tray with runway dropouts, complete with splice hardware, runway termination hardware, and ceiling support hardware. Constructed of steel tubing with 12-inch (305 mm) rung spacing.
2. Size: As indicated on drawings.
3. Cross-members welded at 12-inch (305 mm) intervals.

D. Accessory Products:

1. Radius drop-cross member, radius drop-stringer, junction splice kit, butt splice kit, wall angle support kit, end closing kit, protective end caps, "L" bracket for ground wire support, 6" cable runway elevation kit.

2.2 BASKET TRAY (UNDER RAISED ACCESS FLOOR)

A. Manufacturer List:

1. Cablofill Products
2. Chatsworth Products Inc. (CPI)
3. Cooper B-Line
4. Monosystems, Inc
5. Panduit

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Underfloor basket tray for organization of structured cabling, complete with floor post connectors, sweeping bends etc.
2. Size: As indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. Adequate clearances of doors, riser spaces, and ceilings for all component of the telecommunications system.
3. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 HORIZONTAL CABLE MANAGEMENT PANELS

A. Process:

1. Install all horizontal cable management per the manufacturer's recommended installation instructions, as indicated in the T-series drawings.
2. All cable bundles inside the telecommunications rooms shall be secured with Velcro™ cable wraps; plastic wire ties are not acceptable.
3. Velcro™ wraps shall not be pulled tight enough to kink the cable jacket.

3.3 VERTICAL CABLE MANAGEMENT TROUGHS

A. Process:

1. Install all ladder rack per the manufacturer's recommended installation instructions, as indicated in the project drawings. Follow all mounting and support guidelines.

3.4 LADDER RACK

A. Process:

1. Install all ladder rack per the manufacturer's recommended installation instructions, as indicated in the project drawings. Follow all mounting and support guidelines.

3.5 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.6 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner

END OF SECTION 271123

SECTION 271126 COMMUNICATIONS RACK MOUNTED POWER PROTECTION & POWER STRIPS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Vertical Power Strips

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Yes.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 271116 – Communications Cabinets, Racks, Frames and Enclosures

1.3 SUMMARY

A. Provides specifications for the provision and installation of equipment power strips in rack or cabinet frames within telecommunications distribution spaces.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).
   1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - Products

2.1 VERTICAL POWER STRIPS

A. Manufacturer List:

1. APC
2. Belden
3. Geist
4. APDU9941 [apc.com] or equal

B. Product Options:

C. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements. The below should be used for a quantity based on the drawings. Mount to PDU bracket on the rack/cabinet.

D. Description:
1. Each Equipment Cabinet in the Data Center shall receive (2) 208v, 30a power, including (2) single-phase, 208V, 20A horizontal power strips:
   a. (2) NEMA L6-30R output receptacles per cabinet
   b. Local power monitoring LED display.
   c. Power Strip receptacle requirements to be confirmed.
2. County IT Cabinet 3 has higher and unique power requirement – refer to Electrical set and match PDU to receptacles specified
3. The (4) VESTA and MOTOROLA cabinets do not receive vertical PDUs
4. The (4) AV Cabinets receive a, L5-30 input Vertical PDU - APC AP7532 or eqivalent

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:
1. Electrical requirements (electrical outlet installation and voltage/amp rating)
2. Adequate clearances of doors and aisle ways, connectivity and wire management components and all components of the telecommunications system.

3.2 VERTICAL & HORIZONTAL POWER STRIPS

A. Process:
1. Secure power strips and other accessories using appropriate factory manufactured brackets and screws.
2. Align devices with rack or cabinet hole patterns to allow for installation of screws in all mounting holes. Hand-tighten screws to factory limits being careful not to over tighten, cross thread or strip screw heads.
3. Final location of each power strip to be coordinated with the designer and the owner.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

3.5 END OF SECTION 271126

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 271323.13 – COMMUNICATIONS OPTICAL FIBER SPLICING & TERMINATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Fusion Splicing Device
2. Optical Fiber pigtail assembly

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270800 – Commissioning of Communications
2. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
3. Section 271119 – Communications Termination Blocks and Patch Panels
4. Section 271323 – Communications Optical Fiber Backbone Cabling

1.3 SUMMARY

A. Provides specifications for optical fiber cable termination and splicing for each strand of optical fiber inside termination shelves.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 FUSION SPLICING DEVICE

A. Manufacturer List is in development.

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. The fusion device shall be portable, fully automatic and compact.
2. Splicer electrodes shall contain an arc-stabilizing feature to prevent spontaneous position shift of the arc emission zone to reduce the average splice loss by up to 50% and also the standard deviation compared to standard electrodes. The splicer shall require minimal maintenance, allowing up to 7000 splices between cleanings.
3. Procedures such as pre-alignment, cleaning, gap-setting, cleave angle monitoring, core-to-core alignment and glass fusion shall be microprocessor-controlled. Multiple splice programs with individual parameter settings shall be selectable, with seven pre-set single-mode and two multimode programs.
4. Course pre-alignment shall be performed automatically; therefore, accurate manual pre-alignment of the fibers shall not be necessary. Precise pre-alignment in z-axis shall be automatically performed with two-step motors. Fine positioning and final alignment of the fibers in three (x, y and z) directions shall be automatically performed with piezo-ceramic actuators, which have a positioning resolution better than 0.1 μm.
5. Upon completion of the splice, the splice loss shall be evaluated automatically. The splice loss value shall be displayed on the LCD display in decibels (dB).
6. The splicer shall be compliant with FCC CISPR 22 EMI and with the "Electromagnetic Compatibility" directive 89/336/EEC and the low voltage directive 73/23/EEC (applicable to only the battery charger).

2.2 OPTICAL FIBER (OM4)

A. Manufacturer List:

1. Corning
2. Commscope
3. Belden

B. Product Options:

1. See Specification Section 271119 Communications Terminations Blocks and Patch Panels for detailed product options

C. Description:

1. LC type connectors with finely grained zirconia ceramic pre-radiused tip.
2. Insertion loss of mated pair at 850 nm to be less than 0.5 dB at acceptance for every connector.
3. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler.
4. Fitted with color-coded strain relief boots to ensure durable and robust connections.
5. Durability better than 500 matings, with an increase in insertion loss of not more than 0.2 dB per 500 matings.
6. Fitted with a tight fitting, polymer cap over the connector to prevent ingress of dirt and dust until the connector is fitted to a coupler.

7. All connectors to be straight-pull and side-pull resistant, preventing accidental optical disconnect:
8. Maximum of 0.2 dB increase in insertion loss for a 20 lbs. straight pull
9. Maximum of 0.5 dB increase in insertion loss for a 5 lbs. side pull
10. Ultimate pull-out from coupling shall require a minimum of 25 lbs

2.3 OPTICAL FIBER (OS2)

A. Manufacturer List:

1. Corning
2. Commscope
3. Belden

B. Product Options:

1. See Specification Section 271119 Communications Terminations Blocks and Patch Panels for detailed product options

C. Description:

1. LC type connectors with finely grained zirconia ceramic pre-radiused tip.
2. Insertion loss of mated pair at 850 nm to be less than 0.5 dB at acceptance for every connector.
3. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler.
4. Fitted with color-coded strain relief boots to ensure durable and robust connections.
5. Durability better than 500 matings, with an increase in insertion loss of not more than 0.2 dB per 500 matings.
6. Fitted with a tight fitting, polymer cap over the connector to prevent ingress of dirt and dust until the connector is fitted to a coupler.
7. All connectors to be straight-pull and side-pull resistant, preventing accidental optical disconnect:
8. Maximum of 0.2 dB increase in insertion loss for a 20 lbs. straight pull
9. Maximum of 0.5 dB increase in insertion loss for a 5 lbs. side pull
10. Ultimate pull-out from coupling shall require a minimum of 25 lbs

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 FUSION SPLICER DEVICE

A. Process:

1. Follow manufacturer's instructions at all times when operating the optical fiber fusion splicing device. Pay particular attention to cleanliness and axis alignment.

2. The technician shall utilize the integrated tensile testing function of the splicing device after each splice to analyze the strength of the fiber joint. The tensile testing load shall be 1.5 N (0.34 lbf) and shall be applied for approximately one second. Any splice failing the tensile test shall be re-spliced immediately.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271323.13

SECTION 271513 – COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. 4-pair UTP Cat 6A cable
2. Coaxial cable
3. 4-pair STP shielded CAT6 cable (for MOTOROLA)

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270553 – Identification for Communications Systems
2. Section 270800 – Commissioning of Communications
3. Section 271116 – Communications Cabinets, Racks, Frames, and Enclosures
4. Section 271119 – Communications Termination Blocks and Patch Panels
5. Section 271543 – Communications Faceplates and Connectors

1.3 SUMMARY

A. Provides specifications for 4-pair copper horizontal workstation cabling to distribute network signals from telecommunications distribution spaces to workstation outlet locations.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 4-PAIR UTP CAT 6A CABLING

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemens
4. Or equivalent

B. Product Options:

1. The manufacturer, once noted above, shall be the only manufacturers acceptable to the Owner and A/E.

C. Description

1. One (1) 4-pair UTP Category 6A cable with a riser rated outer jacket
2. Physical specifications: 4 twisted pair – 23 AWG, solid copper conductors, 100-Ohm nominal impedance +/ 15%.
3. Electrical characteristics: Able to meet or exceed the channel specifications of ANSI/EIA/TIA-568-C-2.10 standard, "Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling", with available bandwidth up to 500 MHz.
4. Mechanical requirements:

    a. Conductors: 23 AWG - solid bare copper
    b. Outer Jacket: Flame retardant CMR
    c. Conductor Insulation: FEP
    d. Break Strength: Minimum 90 lbs.

5. Color Code:

    a. Jacket: BLUE
        1) County IT – Blue Jacks
        2) Security - Blue Jacks
        3) AV – Yellow jacks

6. Insulation:

    a. Pair 1: White/Blue - Blue/White
    b. Pair 2: White/Orange - Orange/White
    c. Pair 3: White/Green - Green/White
    d. Pair 4: White/Brown - Brown/White

7. UL listed, Type CMR and CMP.
8. Used for workstation cabling distribution
9. Commscope Category 6A UTP cable, Part No. 1091B (CMR) or equivalent
10. Used for workstation cabling distribution

D. Accessory Products:

1. Provide any accessory products related to the UTP copper 4-pair cabling required to provide a complete and functional infrastructure system

2.2 4-PAIR STP CAT 6 CABLING (SHIELDED)

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemon

B. Product Options:

1. The manufacturer, once noted above, shall be the only manufacturers acceptable to the Owner and A/E.

C. Description

1. One (1) 4-pair STP Category 6 cable with a riser rated outer jacket
2. Physical specifications: 4 twisted pair – 23 AWG, solid copper conductors, 100-Ohm nominal impedance +/ 15%.
3. Electrical characteristics: Able to meet or exceed the channel specifications of ANSI/EIA/TIA-568-C-2.10 standard, "Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling", with available bandwidth up to 250 MHz.
4. Mechanical requirements:
   a. Conductors: 23 AWG - solid bare copper
   b. Outer Jacket: Flame retardant CMP
   c. Conductor Insulation: FEP
   d. Break Strength: Minimum 90 lbs.

5. Color Code:
   a. Jacket: Blue
   b. Jacks: White

6. Insulation:
   a. Pair 1: White/Blue - Blue/White
   b. Pair 2: White/Orange - Orange/White
   c. Pair 3: White/Green - Green/White
   d. Pair 4: White/Brown - Brown/White

7. UL listed, Type CMP
   Used for workstation cabling distribution

D. Accessory Products:

1. Provide any accessory products related to the STP copper 4-pair cabling required to provide a complete and functional infrastructure system

2.3 COAXIAL CABLE

A. Manufacturer List:

1. Belden
2. Commscope
3. Or equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. Physical Specifications:

a. 75Ω quad-shielded RG6 coaxial cable
b. 18 AWG solid bare copper-covered steel conductor with gas-injected foam polyethylene insulation.
c. Minimum bend radius (loaded) is 20 times cable jacket outside diameter.
d. Minimum bend radius (unloaded) is 10 times cable jacket outside diameter.
e. Cable shall be plenum-rated.

2. Electrical characteristics:

a. 75 +/-3Ω Impedance
b. 84% velocity of propagation
c. Nominal Capacitance of 16 pF/ft (52.5 pF/m)
d. Inner Conductor DC Resistance of 11 Ω/kft (36.1 Ω/km)
e. Shield DC Resistance of 3.9 Ω/kft (12.8Ω/km)
f. SRL between 5 and 1000 MHz of 20dB minimum
g. SRL between 1000 and 3000 MHz of 15dB minimum
h. Attenuation shall not exceed 9.88 dB/100' (32.41 dB/100m) @ 3,000 MHz.

3. Used for:

a. CATV horizontal and vertical (riser) distribution
b. Each piece of fitness equipment needs coax

4. UL listed, Type PVC.
5. Belden Duobond RG6U, Part No. 1369A or approved equivalent (CMR)
6. Belden Duobond RG6U, Part No. 1189A or approved equivalent (PVC)
7. Belden Duobond RG-11

D. Accessory Products

2.4 Provide any accessory products related to the coaxial horizontal cabling required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The TRs are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 COPPER CABLING INSTALLATION

A. Process:

1. Install all horizontal station cabling per the manufacturer's recommended installation instructions, under the guidelines of TIA/EIA-568C and BICSI standards, and in quantities indicated in the drawings.
2. Install all cables with proper attention paid to bend radii, pulling method, attachment method, and pulling forces. All cable shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded as noted in TIA/EIA 568C and BICSI guidelines. Also refer to the cable manufacturer's specifications for exact cable requirements per the particular cable type.
3. All cables shall be visually inspected for insufficient bend radius during and after pulling. Damaged cables, or those installed under questionable methods and/or circumstances shall be replaced at no additional cost to the owner.
4. Contractor shall ensure that all TIA/EIA and industry standards are met with special regards to maximum stripping length of cable jackets. No four (4) pair UTP cables shall have more than ½ inch (12.7 mm) of cable jacket removed beyond the termination points.
5. Install the horizontal cabling with attention paid to aesthetic means and methods when routing cabling within IT spaces.
6. All cabling distributed horizontally through metal stud framing shall have plastic protective bushings inserted to protect cables prior to installation.
7. All cables shall be clearly labeled on both ends and in an accessible location no more than 6-inches (152 mm) from the cable ends.
8. The owner reserves the right to specify a new location for any outlet or equipment without increasing contractor unit cost – providing that the new location is specified prior to roughing-in of technology cable and is not farther than 10-feet (3m) away from the original location specified.
9. When conduits, sleeves and cable trays (provided under the electrical work) are not present, support all cables with J-hooks and/or cable straps mounted to the ceiling above. Provide supports at maximum 5-foot intervals. Do not install more than 24 cables in any single J-hook for support. When more than 24 cables must be installed, provide additional J-hooks or cable straps.

10. Install workstation cable in accordance with this Specification, the approved Cable Termination Schedule, the manufacturer's recommendations, and the Telecommunications Distribution Drawings.
11. After dressing each cable to its final location, remove only enough jacketing to allow the conductors to be splayed and terminated in a neat and uniform fashion. Every effort shall be made to maintain jacketing integrity by removing only as much jacketing as is practical to accomplish termination. For twisted pair cables, maintain the manufacturers' twisting of the wire pairs through to the point of termination.
12. Install all UTP cable according to manufacturer's installation standards.
13. Terminate all cables neatly, with enough slack to pull off, test, re-cut and re-terminate each cable as needed. All ceiling copper cables should include a 12-foot slack loop on the ceiling termination side to facilitate the repositioning of wireless access units as needed to provide balanced wireless signal coverage. The slack should be neatly coiled and secured with a Velcro tie.
14. When pulling cables through conduits, leave in-place all draglines for future use.
15. Provide a 12-inch (305 mm) service loop at all workstation locations unless otherwise noted. The workstation loops shall be stored at the top of each conduit stub-up in the accessible ceiling area, or wherever it is possible to be concealed and supported.
16. Provide Velcro tie wraps to organize and bundle all category rated cabling installed under this Work. Install the approved Velcro strips long enough to overlap at least 1.5 inches (38 mm) around the installed cables. Plastic tie wraps shall not be used.
17. Do not allow telecommunication cables to run parallel with electrical cables/conduits, unless they are separated by a minimum of 12-inches (305 mm).
18. Any telecommunications cables that must cross over electrical cables/conduits shall do so only at 90-degree angles.
19. Do not lay telecommunications cables unprotected on the floor at any time. If cables must be left on any floor, protect the cables so that they may not be walked on or have any material or equipment placed or rolled on top.
20. Maintain manufacturer's recommended minimum bend radius of the cables. Do not stretch, stress, tightly coil, bend or crimp the workstation cables during the installation or when leaving them out of the way of other trades during the staging of the work. The Contractor, at the Contractors sole expense, shall replace all abused or stressed cables.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271513

SECTION 271543 – COMMUNICATIONS FACEPLATES & CONNECTORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Optical fiber connectors
2. Outlet Housing Components (faceplates etc…)

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270553 – Identification for Communications Systems
2. Section 270800 – Commissioning of Communications
3. Section 271513 – Communications Copper Horizontal Cabling

1.3 SUMMARY

A. Provides specifications for fiber optic backbone, horizontal workstation cable termination components, and outlet housing components. Includes wall-mount, floor-mount, and ceiling-mount components to support the various workstation outlets throughout the cabling plant.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 OPTICAL FIBER CONNECTORS

A. Manufacturer List:

1. Corning
2. Commscope
3. Belden
4. Or equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Singlemode fiber connectors compatible with fiber optic cable specified in Section 271323.
2. LC Type multimode rated connectors with finely grained zirconia ceramic pre-radiused tip.
3. No-epoxy/no-polish field installable connectors.
4. Insertion loss of mated pair at to be less than 0.5 dB.
5. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler.
6. Fitted with color-coded strain relief boots to ensure durable and robust connections.
7. Durability better than 500 matings, with an increase in insertion loss of not more than 0.2 dB per 500 matings.
8. Fitted with a tight fitting, polymer cap over the connector to prevent ingress of dirt and dust until the connector is fitted to a coupler.
9. All connectors to be straight-pull and side-pull resistant, preventing accidental optical disconnect:
   a. maximum of 0.2 dB increase in insertion loss for a 20 lbs. straight pull
   b. maximum of 0.5 dB increase in insertion loss for a 5 lbs. side pull
   c. Ultimate pull-out from coupling shall require a minimum of 25 lbs

2.2 UTP CAT6A CONNECTORS

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemens
4. Or equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Non-keyed 8 pin modular connectors, suitable to terminate UTP 4-pair cables. Suitable to be mounted in corresponding faceplate, mounting plate or surface mount box.
2. Provide Category 6A rated eight-conductor RJ45 connector.
3. EIA/TIA T568B wiring scheme.

4. Performance criteria: Able to meet or exceed the channel specifications of the ANSI/TIA/EIA-568-C.2-10 standard for Augmented Category 6 system performance up to 500 MHz.
5. Commscope part number 760181941, or approved equivalent from manufacturers listed above
6. Color: as described
    1) County IT – Blue Jacks
    2) Security - Blue Jacks
    3) AV – Yellow jacks
7. CAT6 Shielded Jacks for Motorola/Vesta cables
    1) Motorola/Vesta – White shielded Jacks

D. Accessory Products:

1. Color-coded Icons – furnish and install (1) color-coded icon for each UTP connector installed in this project. Exact colors and styles shall be determined during product submittal review.
2. Provide any accessory products related to the UTP connectors required to provide a complete and functional infrastructure system.

2.3 OUTLET HOUSING COMPONENTS

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemens
4. Or equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. All outlet housings at the various technology outlet locations shall provide the designated number modular insert ports as indicated in the drawings.
2. All flush-mounted faceplates shall be available in one (1), two (2), three (3), four (4), and six (6) port configurations of the same single gang style outlet and eight (8) port configurations of the same double gang style outlet.
3. Faceplates for wall-mounted phones shall be one (1) port stainless-steel single gang faceplates that have wall-mount lugs allowing vertical phone mounting.
4. Faceplates for flush floor mounted outlets shall be coordinated with the floor box that will be selected and installed outside the scope of this section.
5. System furniture faceplates shall be capable of fitting in the furniture system selected by the Owner. Quantity of furniture faceplates shall satisfy outlet jack requirements. Furniture faceplate extenders shall be used (if required) to maintain proper bend radii within the furniture raceway/pathway.
6. Surface mounted boxes shall be capable of the quantity of outlet jack requirements at each outlet locations indicated in the drawings. Provision (1) surface mount outlet box at all furniture-mounted outlet locations and Wireless Access point locations in the ceiling.
7. Surface-raceway mounted outlets shall be capable of being installed within surface-raceway provided and installed by others. Contractor to provide appropriate mounting bezels and keystone jacks (as necessary) for proper mounting within surface raceway.

8. All outlet-housings shall provide a clear TIA/EIA 606-B labeling location for both the individual outlet port and the entire outlet housing location, unless otherwise indicated in the project drawings.
9. All faceplates shall be provided in a color that matches the electrical trim color unless otherwise noted in the drawings. Colors to be coordinated with Architect during submittal phase.
10. Four port plate, White Commscope Part No. 108333154 – M14LE-246 or approved equivalent from manufacturers listed above
11. Two port plate, White Commscope Part No. or approved equivalent from manufacturers listed above
12. One-port stainless steel wall phone mounting plate
13. Coordinate furniture bezels and faceplates for table mounted outlets with furniture supplier

D. Accessory Products:

1. Provide any accessory products related to the workstation outlet housing components required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

B. Confirm all housings including back boxes, floor boxes and poke-throughs provided for the telecommunications connectivity system will support the installation of project approved manufacturer components prior to purchase of the components described in this specification.

3.2 UTP CONNECTORS

A. Process:

1. Install all connectors under the guidelines of the manufacturers' recommended instructions and per all TIA-568-C standards, BICSI guidelines, and manufacturer approved industry practices.
2. The installation and performance parameters of all installed couplers and connectors shall be verified by the trade contractor through TIA-568-C testing procedures.
3. Color of all connectors shall be coordinated with the Architect and/or Owner before purchase and installation.

3.3 OUTLET HOUSINGS

A. Process:

1. Color of all outlet housing components shall be coordinated with the Architect and/or Owner before purchase and installation.
2. All technology outlets located on walls shall be flush mounted, level and plumb.
3. All technology outlets shall be mounted at right angles and parallel to the floor, unless installation requirements or design dictate otherwise.
4. Install blank inserts in outlet housing spaces that are not being filled with cable termination modules. Blank inserts shall match the workstation housing color, unless otherwise indicated in the drawings.

5. All outlets located in systems furniture may be served from a wall adjacent to the furniture cluster or a floor box/floor-feed. If the cable is exposed prior to entering furniture raceway, install spiral wrap tubing to protect the cable per the manufacturer's recommendations.
6. All outlet housings as well as each individual utilized port must be labeled in accordance with the Owner-approved labeling scheme.

3.4 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

3.5 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271543

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 271619 – COMMUNICATIONS PATCH CORDS & STATION CORDS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 ACTION SUBMITTALS

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. 4-pair UTP CAT 6A patch cords

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections

1. Section 271619 - Communications Patch Cords, Station Cords, And Cross Connect Wire

a. 4-pair cat 6A UTP patch cords

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 270553 – Identification for Communications Systems
2. Section 270800 – Commissioning of Communications
3. Section 271119 – Communications Termination Blocks and Patch Panels
4. Section 271543 – Communications Faceplates and Connectors

1.3 SUMMARY

A. Provides specifications for 4-pair copper patch cabling connecting LAN switches to patch panel where horizontal copper UTP is terminated.

1.4 RELATED DOCUMENTS

A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).

1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

A. Manufacturer List:

1. Commscope
2. Belden
3. Siemens
4. Or equivalent

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description

1. Physical Specifications: 4-pair, 26 AWG stranded copper UTP cable, with male 8-pin modular RJ45 plugs with insert-molded strain relief on both ends.
2. Performance Characteristics: Able to meet or exceed the channel specifications of the ANSI/TIA/EIA-568-C.2-10 standard for Augmented Category 6A cable up to 500 MHz.
3. All patch cords supplied must comply with ANSI/TIA/EIA-568-C.2-1, Production Modular Cord NEXT Loss Test Method, and Requirements for UTP Cabling.
4. Wiring: T568B.
5. Contractor shall provide and include into the bid sum the price for the patch cords shown in the following descriptions:
   a. Commscope CAT 6A UTP (OR EQUIVALENT)
      1) (1) patch cord at DATA CENTER & (1) 7' patch cord at station end
      2) Blue slim run patch cords in the DATA CENTER
      3) Commscope Part # MiNo6A-BL
      4) 1' white patch cord for each WAP at station end
   b. Contractor to size patch cords for the DATA CENTER appropriately
   c. All applications should utilize coded cables patch cables to identify the application group of Blue , White, and Yellow with various appropriate lengths.
      1) Blue patch cords are for IT, Security and non mission critical devices
      2) White patch cords for DES, Motorola (shielded) and mission critical devices
      3) Yellow patch cords for AV

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The DATA CENTER is the size shown on the project drawings.

3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

3.3 Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271619

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 27 41 16

AUDIOVISUAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Audiovisual equipment/systems and related control systems & programming.

B. Related Work

1. Audiovisual Contractor shall coordinate with the Structured Cabling Contractor for connection of all network enabled AV equipment to the structured cabling system (twisted pair and coaxial cabling).
2. Audiovisual Contractor shall coordinate with the Owner for connection of all network enabled AV equipment to Owner provided network switches, PoE power, wireless access points, VoIP interfaces as indicated on the drawings and equipment lists.
3. Audiovisual Contractor shall coordinate with the General Contractor and Electrical Contractor for final locations and routing of all audiovisual infrastructure including power, empty low voltage backboxes/conduit, required fire rated penetrations supporting all audiovisual equipment.
4. Audiovisual Contractor shall coordinate with the General Contractor and Miscellaneous Metals Contractor for location and attachment method of all structure/support systems provided under this scope of work for displays, video walls, speakers, cameras, racks and all other audiovisual equipment that is secured to the building.
5. Audiovisual Contractor shall coordinate with General Contractor for site logistics, schedule and access.

1.2 GENERAL CONDITIONS

A. The General Conditions, Requirements, and Special Provisions, of the larger body of specifications, of which this specification is a part, are hereby made a part of this specification. In the event that any clauses or provisions of the larger body of specification conflict with the letter or intent of this specification, the Contractor shall immediately notify the Consultant for clarification and direction.

1.3 THE SPECIFICATION

A. The "Specification" is defined as the body of documentation provided to the Contractor with the Request for Quotation, as well as all addenda to said documentation. Throughout this document, words such as "herein" refer to the entire Specification, and not just this written document.

1. The Specification includes, but is not limited to:

a. This written specification document.

b. The attached Audiovisual Systems Equipment List

c. All drawings, as listed in the List of Drawings or indicated on the drawing package cover page.

d. Additions and/or modifications as detailed in written addenda.

e. Additions and/or modifications as detailed in drawing additions or reissues.

B. Definition of Terms

1. Within this section of the specification, the following definitions shall apply:

2. The term "Owner" is used to indicate: ULSTER COUNTY.

3. The term "Architect" is used to indicate: ALFANDRE ARCHITECTURE.

4. The term "Construction Manager" is used to indicate: THE PALOMBO GROUP.

5. The term "General Contactor" is the entity responsible for fit out of the interior spaces.

6. The term "Consultant" is used to indicate: CERAMI & ASSOCIATES

7. The term "Bidder" is used to indicate that entity generating the bid response.

8. The term "Contractor" is used to indicate the successful Bidder to whom the Owner has awarded the contract.

9. The term "Furnish" is used to indicate the responsibility to procure and ship or deliver the item to the job site, freight prepaid, for receipt, staging and installation by others.

10. The term "Install" or "Installation" is used to indicate the responsibility of receiving the item at the job site, assuring adequate storage, unpacking or uncrating the item, physically securing the item or otherwise making ready the item for its intended use by following the instructions and approved methods of the manufacturer and those contained herein.

11. The term "Provide" is used to indicate the responsibility to both "Furnish" and "Install".

12. The term "Provided by Others" shall refer to material and work, which is related to this contract, but has been provided by parties other than the AV Contractor. An example might be in reference to a projection screen installed during building construction but requiring interface to the AV control system.

13. The terms "NIC" and "Not in Contract" are equivalent to "Provided by Others".

14. The term "OFCI" (Owner Furnished Contractor Installed) shall refer to equipment that will be furnished by the Owner for installation by the Contractor. The Contractor shall be responsible for installing and integrating this equipment as detailed herein.

15. The term "Installation Materials" shall reference installed cable, loose cable, terminations, cable management, voice/data/video patch cords, adapters, I/O panels, cable dressing, lacing bars, copper bus bars, labels, rack shelves, rack mounts, power strips/distribution and other materials as needed to install the systems defined herein.

16. The term "shall" is mandatory; the term "will" is informative; and the term "should" is advisory.

1.4 BIDDER QUALIFICATIONS

A. Unless superseded by the General Conditions or Owner's Representative request for proposal documents the following qualifications are required for any bidder of this scope of work.

B. Contractor Qualification Requirements: Bidder shall submit on or before the date of the Pre-Bid Meeting evidence of his/her qualifications to perform the work specified. Contractor qualifications shall be the most current information available but not more than one year old. Submit one copy of documentation to both Owner and Consultant for review and approval. Transmit documentation to be received no later than the scheduled time of Pre-Bid Meeting. Materials shall include:

1. Corporate Profile
2. Location of Corporate Headquarters
3. Number of offices and locations
4. Location of office assigned to this project
5. Corporate History
6. How Many years in this business?
7. Under what former names have your organization operated
8. Date(s) of incorporation
9. State of incorporation
10. Officers names and addresses

C. Litigation Experiences within the Last 5 Years

1. Project Related:
    a. Nature of Litigation
    b. Plaintiff or Defendant
    c. Outcome
2. Non-Project Related
    a. Nature of Litigation
    b. Plaintiff or Defendant
    c. Outcome

D. Number and Type of Full-Time Staff

1. Total number of employees
2. Number of design staff
3. Number of installation staff
4. Number of project management staff
5. Number of software programming staff

E. Identify key personnel that will be assigned to this project including:

1. Project Executive
2. Project Manager
3. Systems Designer
4. Crew Chief/Superintendent/Lead Technician
5. Systems Programmer

6. Commissioning Agent

7. Trainer

F. For each Individual listed above provide a resume that includes:

1. Office Location

2. Percentage of individual's time that will be allocated to this project

3. Work History

4. Previous Project Experience

5. Length of Employment

6. Certifications: CTS, CTS-D, CTS-I, RCDD, PMP, Certified Control System Programmer, Certified DSP Programmer, video projection manufacturer specific certification, other.

7. The contractor's lead installer shall hold a current CTS-I (Certified Technology Specialist – Installation) certification from InfoComm International, and/or a current EST-L2 (Electronic Systems Technician) certification from NSCA. The Contractor shall submit the name of the lead installer and certification expiration dates.

8. Due to the potential complexity of the control system, a manufacturer certified software programmer shall be required to author the programming components of this project. The Contractor shall include in the bid response, the name of the manufacturer certified person or entity that will provide programming for the remote control system. The resume shall include a listing of years of experience and include a statement of manufacturer authorization, certification type, date of certification and the certificate number.

9. The project will utilize Digital Media Systems from one of several approved manufacturers. The Contractor shall provide documentation listing project team member(s), named in Section 1.4.D above, who will work on the project and who are manufacturer certified for all systems included in these Specifications with active certification. The documentation shall include a listing of years of experience and include a statement of manufacturer authorization, certification type, date of certification and the certificate number.

10. The project will utilize Digital Signage and Video Distribution System products from one of several approved manufacturers. The Contractor shall provide documentation listing project team member(s), named in Section 1.4.E above, who will work on the project and who are manufacturer certified for all systems included in these specifications with active certification. The documentation shall include a listing of years of experience and include a statement of manufacturer authorization, certification type, date of certification and the certificate number.

11. This project will utilize union installation labor. The Contractor shall provide documentation indicating if union labor will be provided by the Contractor or a Contractor designated and managed sub-contractor. The Contractor shall indicate the company name, address and contact information for the intended union sub-contractor included in the audiovisual bid.

G. Resources

1. A manufacturers' line card for products in which the Contractor is an authorized Distributor or Dealer. Include date initially authorized.

2. A list of any manufacturers' specialized technical certifications or designations held by the Contractor.

3. A list of manufacturers for whom the Contractor is an authorized service center.

4. A list of computer software and/or systems owned by the Contractor, which will be used to communicate, measure, draw, and/or document the project.

5. A list of system test equipment owned and used by the Contractor, including manufacturer, model number and, where applicable, latest software revision.

H. References

1. Include three projects of:

   a. Similar scope and scale.

   b. Similar technology applications

   c. Provide project cost for each

2. Include three project references, including:

   a. Contact name

   b. Institution name

   c. Phone number

   d. E-mail address

3. List any past projects where Contractor has worked with the Owner, Consultant, Architects, or Construction Manager who are part of this project team.

I. Subcontractors

1. A list of all subcontractors proposed for use on the Project.

2. For each subcontractor proposed:

   a. Subcontractor firm name

   b. Name(s) of subcontractor firm principal(s)

   c. Description of subcontractor firm sub-specialty

   d. Subcontractor firm qualifications and justification for subcontracting

   e. Acceptability of subcontractors shall be at the sole discretion of the Owner.

1.5 SITE CONDITIONS

A. Labor and Physical Access

1. The Bidder shall be responsible for investigating any potential conflicts with site-related or union-related issues regarding use of personnel, scheduling, access to the site, storage of tools and equipment on-site, and other areas of potential conflict. If these issues impact the Bidder's bid response, the impacts on cost and schedule should be clearly noted in the bid response.

B. Equipment Delivery and Storage

1. Costs of all shipping to the site, and of all storage requirements, shall be borne by the Contractor. It shall be the responsibility of the Contractor to make appropriate arrangements,

and to coordinate with the authorized personnel at the site, for the proper acceptance, handling, protections, and storage of equipment so delivered.

C. Refuse

1. The Contractor shall keep the site and building free of all debris and clutter, to the satisfaction of the Owner or Construction Manager. On a daily basis, the Contractor shall remove refuse and rubbish related to the specified work from the site and building and shall leave the relevant areas and equipment clean and in an operational state. The Contractor shall be responsible for repairing any damage caused to the site and building by the Contractor's installation activities, at no cost to the Owner.

1.6 SCOPE OF WORK

A. General: Provide audio visual systems design, engineering, and installation within all phases and spaces of the project, as defined by the related documents. Systems shall include all devices, equipment, installation, programming and commissioning in accordance with requirements of the contract documents and drawings.

B. The work detailed within the contract documents has been specified to meet certain requirements for performance, appearance, and costs. It shall be the responsibility of the Contractor to implement the guidelines and requirements contained in the contract documents and translate them into a complete design package containing all elements necessary for a complete, operational, and functionally integrated Audio Visual System(s).

C. The Contractor shall provide complete, turnkey multimedia systems performing all of the services and functions as described herein, together with all other apparatus, cable, materials, labor, tools, transportation, and any other resources necessary to provide a complete and working system.

1. The included Audiovisual Systems Equipment List is NOT a complete bill of materials and includes major components that the Owner has identified as required or preferred.

D. Specifically, the work shall include, but is not limited to:

1. Communicating and coordinating with the Owner, Consultant, Architect, and other trades complying with all requirements as defined under this Scope of Work and elsewhere, to fulfill all requirements of this specification.

2. Generating and submitting Shop Drawings as required for approvals and As-Built drawings as specified herein.

3. Providing all cable and pull strings in conduits for the specified systems.

4. Furnishing and/or installing all equipment as specified.

5. Installing Owner supplied equipment as specified.

6. Take delivery of all Owner supplied components and equipment, excluding Room PCs, at Contractor's staging facility for integration into AV equipment racks.

a. No Owner furnished equipment has been identified at this time as previously used in existing facilities.

7. From the initial point of delivery Contractor shall be responsible for storing, integrating and maintaining as part of the system warranty all Owner supplied components.

8. Prior to installation Contractor shall test and verify all functions of Owner supplied components and equipment previously used in existing Owner's facility. Contractor shall

provide a summary report of existing Owner supplied equipment and document any defects or service issues that would prevent existing equipment from reuse as part of this work.

9. Coordinate with Owner's content provider to determine optimal resolution and format for any Owner provided content. Stand up the content playback system prior to installation and load initial content samples for validation of playback system final configuration and settings. Demonstrate content playback operation and configuration to Owner's content provider for approval prior to final implementation of the content/playback systems.

10. Take delivery of initial graphic content and audio (including licenses, accounts or other means for accessing pre-packaged or streaming content). Load/enable all content and prepare initial templates or configuration files in all content management/playback systems configured for the display and audio systems provided under this scope of work.

11. Coordinate video conference endpoint provisioning with the Owner's network and the Owner's existing video conference bridge system or outsourced video conference bridging service.

12. Furnishing all lifts, ladders, scaffolding or other resources as needed for proper safe installation. Coordinating with other trades as needed.

13. Interconnecting all components, both internal and external to rack cabinets.

14. Providing patch cables for connection of all IP-enabled audiovisual equipment to associated data network outlets, including but not limited to Owner supplied Room computers, production computers, laptop connections, control system processors, codecs, IP cameras, and projectors. This applies to all equipment installed by the Contractor, including Owner-Furnished (OFCI) items. Coordinate patch cable requirements with the greater building-wide structured cabling system.

15. Contractor shall coordinate and secure, from the Owner, the IP configuration parameters such as DHCP, IP addresses, subnet information, VLAN setup & authorization, and the like for use by Ethernet equipped system components. As part of this coordination, Contractor shall create a device tracking document sortable by room, floor or equipment type and including mac address, serial number, network plate and patch number and network configuration parameters. The Contractor shall coordinate the installation and configuration of these devices with the Owner's IT department and/or designated representative.

16. Secure, from the Owner, private IP addresses for use by Ethernet equipped control system processors.

17. Ensuring that all cabling, equipment, and terminations are installed in accordance with accepted industry standards, approved shop drawings, manufacturer's recommendations and as stipulated herein.

18. Verify that all audiovisual equipment rack locations are provided with adequate clearance, ventilation and cable management systems to ensure all equipment is operating within manufacturer published tolerances.

19. Coordinating and providing cable labels as stipulated by the owner and/or specified herein.

20. Providing cable management hardware as required including in areas audiovisual rack cabinets; between pieces of equipment not housed in rack cabinets; and as required to extend cabling from rack cabinets and equipment to the greater facility cabling infrastructure.

21. Providing custom cover plates, wall plates, I/O connection plates, floor box insert plates as required for a complete and working system. Final selection of finishes shall be coordinated with the Architect and/or Owner.

22. Coordinating with the Consultant, Architect and Owner on the final selection of all technical furniture including design details (make/model), available options, dimensions, cable management needs, color, finish, and the like.

23. Provide all furniture and lectern hatch connector plates using industry standard AAP style or similar connectors or pass-thru openings. Provide mating or pull-out cabling for all furniture and lecterns to mate with user portable devices.

24. Coordinating with furniture manufacturer or others who are providing all necessary furniture/millwork modifications ("cut-outs" or other) as required allowing for a neat and professional installation of integrated technology system components. This includes, but is not limited to: integrated table/lectern "cubbies", table-top microphones, cable management grommets, etc.

25. Coordinating with the furniture manufacturer, Owner, and Architect on cable management needs and equipment installation requirements in all spaces so equipped and as outlined in 'Installation Practices'.

26. Conduct a wireless site survey within 30 days prior to substantial completion to determine available wireless frequencies for audiovisual equipment. Coordinate with local entities as necessary (manufacturer, Owner, SBE, FCC, etc.) to determine final channel selection for all wireless devices and resolve conflicts where they may occur.

27. Coordinate with the end user on Bluetooth preferences for all devices in the system and set the day 1 Bluetooth enabled/disabled state per end user direction.

28. Insuring that all equipment, with the exception of portable equipment, is firmly fastened or attached in place. A safety factor of at least Five shall be utilized for all brackets, fasteners and attachments. Provide safety retention cables for overhead equipment such as loudspeakers, projectors, etc.

29. Verifying and providing all projector lenses where required.

30. Providing all projector mounts, including guy wires, clamps, or support assemblies back to structural members. Obstructions vary from room to room; Contractor must pay close attention to this issue on a room-by-room basis.

31. Mounting / aligning the projectors so that digital keystone correction is not required. Optical lens shift shall be employed, only if necessary, to align the image with the image area. Where possible all projectors mounted below the ceiling shall be mounted and adjusted to be perpendicular to the screen surface.

32. Ensure that all systems have HDCP, EDID and resolution management profiles which are maintained from input through output/encode/display. Provide EDID management profiles to Owner's content provider 90 days prior to loading of initial content.

33. Coordinating with the Construction Manager on the audiovisual control system connection to the projection screens and lifts, as required.

34. Adjusting motorized projection screen limits as required optimizing the amount of black drop in conjunction with the projection system and field conditions. Refer to the drawings for specified dimensions.

35. Providing speakers as complete assemblies with back boxes, grilles, tile bridges, wall mounts, hanging hardware and other installation hardware as required.

36. Coordinating with the Architect and Owner on final color selection, and/or the painting of any exposed loudspeakers and any/all exposed system components to match the room's aesthetics and finishes.

37. Providing control system design submittals and up to two control system design revisions.

38. Developing and installing all custom control programming code as required and/or as specified herein.

39. Providing control system interfaces to motorized screens, as specified.

40. Providing low voltage control system interfaces to facility lighting and share systems where specified.

41. Coordinating and providing low voltage interfaces to the life safety platform for audio muting in all event and public assembly spaces.

42. Providing the executable (uncompiled) programming control code as defined herein.

43. Developing and installing all custom software for DSP devices as required to optimize system performance.

44. Generating and Submitting "Progress Reports" as defined herein.

45. Ensuring that all individual components function as intended by this Specification.

46. Ensuring that the entire multimedia systems function as intended by this Specification.

47. Providing any/all patching, caulking, fire stopping, and painting required to restore damaged finishes during installation.

48. Providing to the Owner, upon completion, all accessories and ancillary items included with the manufacturer's equipment but not used for the physical installation of the device. This shall include all user manuals, remote controls, batteries, tools, installation hardware, carrying cases, protective covers, etc.

49. Testing, adjusting, and fine-tuning the completed systems and components.

50. Coordinating and conducting acceptance walk-through and sign-off sessions with the Owner and Consultant.

51. Coordinating and conducting an acceptance walk-through and sign-off session with the Owner and Consultant.

52. Documenting the completed installed systems as defined herein.

53. Conducting training in systems operation for the Owner's designated representative(s).

54. Providing "sign-off" documents for each space and/or space type as defined in Section 3.6 "System Setup and Tuning" of this specification.

55. Verifying required cable lengths for all bulk cable or manufactured cable assemblies prior to ordering as outlined in 'Installation Practices.'

56. Verify AV related infrastructure requirements including conduit, power and data as shown on design drawings is sufficient to meet all AV systems requirements. A written report confirming infrastructure requirements is required from the Contractor within 30 days of award of bid.

57. Verifying all display mounting conditions including width, height and depth of all recesses or architectural cutouts required for displays and other flush mounted equipment.

58. Verifying the accuracy of the manufacturer master quotes where indicated on the audiovisual equipment list or other manufacturer quotation numbers prior to ordering. Where given,

master quote numbers or other quotation numbers have been provided for bidding purposes only.

59. For all LED Video Wall systems

    a. Validate all power, cooling, weight, mounting, lead time, delivery and installation sequencing requirements within 30 days of award and communicating in a timely fashion any system parameters not in conformance with the current space design or project schedule.

    b. All video wall systems shall be HDMI 2.0 & HDCP 2.2 compliant. Contractor shall demonstrate the ability to show protected content in current formats as part of acceptance testing.

    c. Review the video processor and signal distribution requirements with the Owner's content provider to confirm conformance to the overall content package.

    d. For all LED Video Wall systems, provide a minimum of 5% spare panels onsite (measured after completion of burn-in, installation, commissioning and final-sign off). Provide an additional 5% spare panels housed at the manufacturer's site for use with break/fix repairs.

    e. Provide an extended warrantee of a minimum of 3 years for all parts and replacement hardware.

    f. Provide onsite manufacturer installation support services including during initial installation, calibration, acceptance testing and training.

60. Providing a minimum one (1)-year warranty service contract for all parts and labor. Where available from individual manufacturers, provide the consultant or preferred client extended warrantees.

61. Provide pricing for years two and three extended warrantees

62. Provide monthly preventative maintenance services for a minimum of (1) year.

63. Providing onsite support staffing as outlined in this Specification.

64. The Contractor shall act as the primary point of responsibility and contact in resolving all audiovisual system defects including those involving Owner Furnished Contractor Installed (OF/CI) equipment.

1.7 ALTERNATES

A. Provide pricing for alternates listed in the audiovisual systems equipment List accompanying this specification.

1.8 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.

B. Refer to AV Design Drawings as listed on drawing TA-000

C. Refer to AV Equipment list provided as part of this specification

1.9 RELATED WORK

A. Audiovisual Contractor shall coordinate with Electrical Contractor on raceway/junction box locations for audio visual equipment and routing of audio, video, control, and power cables/raceway from equipment, terminal and pull boxes to system equipment racks.

B. Coordinate work of this section with installation of wall and ceiling finishes.

1.10 WORK EXCLUDED

A. Work not included under this contract shall be:

1. Providing conduit, power receptacles, junction boxes, cable raceways, electrical back-boxes, floor boxes, lighting fixtures, lighting dimming systems, or millwork except where otherwise specified herein.

2. Installation of wall or ceiling mounted projection screens.

3. With the exception of audiovisual network switches and interconnections as indicated in the audiovisual systems equipment list and system drawings the data and voice network is Provided by Others under separate contract for this building.

1.11 SCHEDULE

A. Project Milestones

1. The Contractor shall obtain from the Owner, Architect, Construction Manager or Consultant a project master timeline schedule showing projected dates when the relevant areas will be available to the Contractor for the on-site installation.

2. Within 15 days of notification of contract award, the Contractor shall provide a schedule of major project milestones to the Owner, Architect, and Consultant. The schedule shall show the following milestones, but may include others as required for overall site-work coordination:

a. Lead time schedule for all equipment

b. Shop Drawings and Submittals.

c. AV infrastructure validation

d. Required date for Owner meeting to review content

e. Required date for receipt of Owner furnished content

f. Delivery of materials to the work site for installation by Others.

g. Delivery of major system components to the work site.

h. Initial Touch Panel layouts

i. Completion of AV Equipment IP list for Owner coordination

j. Required date for receipt of Owner furnished equipment and PCs

k. Required network turn-on date for Audiovisual Connectivity

l. 50% completion of work by floor and by floor area.

m. 95% completion of work by floor and by floor area.

n. Completion of room run sheets (required prior to move-in).

o. Final punch list.

p. Training Sessions.

q. Submittal of Final Documentation / As-Builts.

3. The Contractor provided schedule shall outline a phased installation approach allowing time for installation, testing, issue remediation and sign-off on representative systems, spaces and programming prior to full scope deployment of systems.

4. If the Contractor feels that he/she will not be able to meet the scheduled project milestone deadlines, he must inform the Owner, Architect, and Consultant at the earliest possible opportunity and include in the notification a schedule catch-up or remediation plan.

1.12 JOB CONDITIONS

A. Coordination

1. In the interest of a coordinated and professional project, the Contractor shall:

a. Coordinate his/her work with that of other trades. The Contractor should anticipate attending weekly project coordination meetings with the Owner, Architect, Construction Manager, Consultant or other trades as required. These meetings shall be separate from weekly construction coordination meetings required by the General Contractor.

b. Afford other trades reasonable opportunity for installation work and for storage of materials.

c. Staff the job to keep pace with other trades.

d. Submit a brief progress report via e-mail to the Consultant, listing the following information in four sections: Schedule, Progress, Work Planned and Issues. The "Schedule" section shall list the status of all project milestones and track impacts to approved milestone dates. The "Progress" section shall list the tasks accomplished since the previous report; this is to include both completed tasks and work-in-progress. The "Work Planned" section shall list the tasks scheduled for the time period extending until the next report; this section should also include both completed tasks and work-in-progress. The "Issues" section shall list any factors that are delaying progress or have the potential to delay progress that involve the Owner, Architect and/or Consultant. The Progress Reports should be concise, utilizing bullet points or other efficient format. The Progress Reports should be submitted at the following intervals:

1). After contract award, while working off-site: every two weeks

2). While working on-site: every week.

e. After on-site work has started the Progress Report shall list the status of each room or space with audiovisual equipment and indicate the current status of items:

1). Cable Pull

2). Mount/Speaker/Backbox Installation

3). Room Ready

4). Display Installation

5). Furniture Installation

6). Rack Installation

7). Field Equipment Installation

8). Programming

9). Commissioning

10). Ready for Consultant Testing

11). Punch List Completion

1.13 SITE CONDITIONS

1. Reference drawings provided to the Contractor for bidding purposes may not reflect construction site as-built conditions. It shall be the responsibility of the Contractor to field-verify all site conditions relevant to his work.

2. The Contractor shall verify dimensions of equipment, equipment arrangements, space availability (including any millwork or cabinetry provided by others) and provide systems that work within the constraints of the space available. The Contractor shall notify the Consultant of any situation where space constraints are a problem, prior to the ordering or purchase of equipment. The Contractor shall bear the expense of providing alternate equipment, which will work within the available space, if space availability problems are discovered after equipment is ordered.

3. Drawings indicate locations of equipment and components. Changes in the location, and offsets of same to accommodate building conditions, and coordination with the work of other trades shall be made prior to initial installation, without additional cost to the Owner.

4. The Contractor shall insure during installation that access is provided to equipment and components requiring operation, service or maintenance within the life of the system.

5. It shall be the responsibility of the Contractor to identify any condition where the recommended environmental and/or electrical operating parameters for specified equipment/products cannot be assured. Should such condition exist, it shall further be the responsibility of the Contractor to notify the Architect and Consultant of any such condition.

1.14 LAWS AND REGULATIONS

A. All equipment, cabling, materials, and installation methodology shall conform to the requirements of the National Board of Fire Underwriters, the current published edition of the National Electrical Code, and all other applicable laws and regulations. The Contractor shall obtain and pay for any additional permits and inspections required by all legal authorities and agencies having jurisdiction over the Contractor's work.

B. The Contractor shall comply with all of the legal regulations, including OSHA safety regulations and regulations of municipal, city, local, and other government agencies having jurisdiction concerning the work of the Contractor. The Contractor shall give all notices and comply with all laws, ordinances, codes, rules, and regulations bearing on the conduct of the work. If the Contractor performs any work which is contrary to such laws, ordinances, codes, rules and regulations, it shall make all changes to comply therewith and bear all costs arising therefrom.

C. The Contractor shall warrant that it and its subcontractors are licensed by the State and as required by local ordinances.

1.15 QUALITY ASSURANCE

A. All equipment for this installation will be new, less than one year from the date of manufacture, and without blemish or defect.

B. The Contractor shall maintain the same project manager and field supervisor throughout the installation, and where practical, maintain the same installers.

C. The Contractor shall supply and install any incidental equipment needed in order to result in a complete and operable system without claim for additional payment, even if such equipment is not listed in this Specification.

D. All work related to this Specification shall be completed in a professional manner by fully qualified workers.

1.16 RELIABILITY

A. General

1. The systems are designed to provide professional quality operation over a period of several years without the need for continual maintenance. Equipment that has a high failure rate is not acceptable for installation as part of these systems.

B. Warranty & Maintenance

1. The Contractor shall act as the primary point of responsibility and contact in resolving all audiovisual system defects including those involving Owner Furnished Contractor Installed (OF/CI) equipment.

2. The Bidder shall make known, in writing, at time of bid any exceptions that might exist between conditions described herein and Bidder's policy of warranty. After acceptance of bid, all conditions and requirements of warranty described herein shall apply.

a. The Contractor shall guarantee all equipment, materials, and labor for a period of 1 year from the date of final acceptance.

b. During the warranty period, within 4 hours of notification, the Contractor shall answer all service calls and requests for information.

c. During the warranty period, within 24 hours of original notification, the Contractor shall provide emergency service to restore operation of the system, replacing defective materials, repairing faulty workmanship, making temporary repairs, and providing loaner equipment as necessary, all at no charge.

d. The Contractor shall notify the Owner before any service call whether such call is or is not covered under warranty. The Owner may be billed for non-warranty calls. The Contractor shall notify the Owner of any service call or work to be performed for which charges may be incurred before such work commences.

e. Improper functioning, for warranty purposes, means failure of the system to meet the intentions of the specification because of internal defects. It does not include Owner caused malfunctions such as re-adjustment of the controls, re-tuning of the system, or injury to the system beyond normal wear. Nor does the warranty cover paint, exterior finishes, fuses, lamps (including projection lamps) or associated labor, unless the damage or failure results from defective materials or workmanship covered by the warranty.

f. The Contractor shall take such actions at the time of installation to insure that all equipment is installed in accordance with the manufacturer recommended environmental and electrical operating conditions and requirements. After installation, the Contractor shall be responsible for the repair or replacement of said equipment that the Contractor installs which fails due to environmental or electrical conditions, even if not covered by the manufacturer's warranty. The Contractor shall not be held responsible for damages due to changes in environmental conditions, which occur after system acceptance.

g. Unless otherwise directed, the Contractor shall activate all manufacturer warranties in the Owner's name. The start date of the warranties shall be the date of final acceptance.

h. If the Contractor has modified certain components, the manufacturer warranty may be void. In this case, the Contractor is responsible for providing warranty coverage equal to that of the manufacturer.

i. The Contractor shall perform (12) system maintenance sessions, one per month after substantial completion. Maintenance shall include a visual inspection, typical operation demonstration and addressing any issues noted on all systems. Contractor shall assume maintenance will be spread over multiple sessions to allow for scheduling around occupied spaces.

j. Certain subsystems and system components may require installation by authorized representatives in order for the complete manufacturer warranty to apply. If this pertains to any subsystem or component for this project, it is the Contractor's responsibility to make arrangements for the complete manufacturer warranty to apply. These arrangements are to be at no additional cost to the Owner.

k. As part of the bid response, the Contractor shall provide the Owner with a proposal to extend the Warranty to cover Year 2 and Year 3 of operation. These offerings are to include all parts and all labor; all conditions and restrictions listed above apply.

1.17 ALTERNATE EQUIPMENT

A. All bids shall be submitted based on the specified equipment. The Bidder may propose alternate equipment. However, all such proposals shall be submitted separately and will be identified as "alternates" with equipment costs shown separate and apart from the costs of the equipment "as specified".

B. Proposals for alternate equipment will receive careful and equitable consideration if the differences do not depart from the overall intent of the design and operation of the system, and are in the best interests of the Owner. All proposed alternate equipment shall work with the existing infrastructure.

C. All such proposals for alternate equipment shall be accompanied by full technical information, "cuts" and specifications for the equipment so proposed. The Bidder shall identify the substantive differences between the alternate and the specified equipment.

D. Owner and Consultant approval in writing is required before an alternate can be considered approved for use. It is at the discretion of the Owner and Consultant to determine if proposed alternates are considered acceptable and approved for this scope of work.

1.18 EXCEPTIONS AND PROPOSED MODIFICATIONS

A. Should the Bidder have recommendations, which will enhance the performance of the system, or reduce costs without loss of performance, reliability and durability, such recommendations shall be included with the bid submission. All suggestions that are of value to the Owner will be taken into consideration in the evaluation of the bid returns. All such proposals shall be made as "alternates", with the appropriate cost modifications shown separate and apart from the costs of the system "as specified". Pricing shall be on a line-item basis.

B. Any and all exceptions to these Specifications and related drawings must be made with the bid submission. In the absence of exceptions, these Specifications and related drawings shall be binding in letter and intent on the successful Bidder. It will further be assumed that the Bidder has examined the design and Specifications in detail, and is prepared to take full responsibility for the performance of the complete installation as designed and specified.

1.19 DEVIATIONS

A. For deviations in equipment or hardware after contract award, the Bidder shall provide a written statement describing why such deviations are requested. The Bidder shall also provide the

manufacturer's specifications and warranty information on proposed substitutions. The Contractor shall be responsible for repaying any additional expenses incurred by other trades, the Consultant, the Architect, and/or the Owner, as a result of instituting such deviations without prior approval.

1.20 REVIEW AND INTERPRETATION DURING BIDDING

A. Notify the Architect and Consultant of any omissions, discrepancies or ambiguities in the documents so a clarification may be issued. Notify Architect, Owner and Consultant if exception is taken to any statement, indication or criterion in the contract documents.

B. Obtain all other contract documents, including architectural, structural, mechanical and electrical, and check to ensure there are no conflicts with work of this section. Notify the Architect and Consultant of all such conflicts, with any suggested alteration to resolve conflicts.

C. Submit all above notification in writing to the Architect and Consultant no less than 14 days prior to bid opening date. Lack of notification shall be understood to indicate acceptance of all requirements of the contract documents, and any future clams shall be rejected.

D. Interpretations or correction to the contract documents shall be issued by Addendum. Interpretations or corrections given by any other method shall not be binding.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Refer to the attached Audiovisual Systems Equipment List for the following:

1. Type and quantity of spaces with audiovisual systems

2. Bullet point description of the audiovisual functions of each space

3. Description and quantities of audiovisual equipment within each space

4. Notes detailing special audiovisual equipment considerations or coordination requirements

5. List of existing Owner furnished equipment

B. New Owner Furnished Equipment

1. Contractor shall take receipt of all new Owner furnished computers, codecs and CATV receivers at the project site and install as indicated in Audiovisual drawing package system flow diagrams.

PART 3 EXECUTION

3.1 SUBMITTALS

A. General

1. The Contractor shall maintain a master set of this entire Specification, including all drawings and addenda, at the site at all times during the installation. Any deviations from the Specification made during the installation shall be marked on this master set. The master set along with all relevant support documentation shall be provided as part of the As Built submittal in the format outlined under Final Documentation.

B. Software

1. The Contractor shall secure from the Owner or Owner's Representative, in writing, approval for all control system graphical user interface layouts (control surfaces), audio DSP device configurations, or other customized software product applications prior to installation.

2. Preliminary Control Surfaces Submittal

    a. Prior to creation of the preliminary control surface submittal the Contractor shall coordinate a meeting among Contractor, Consultant and Owner to discuss overall programming intent and specific requirements or concerns that the Owners or consultant has related to the control surface look, operation and capabilities.

    b. The intent of the preliminary control surfaces submittal is to create a base level collaboration tool whereby the contractor can solicit direction from the Owner and Consultant towards a mutually agreeable design. Based upon the equipment lists and control system functionality provided in the Audiovisual Systems Specification and in combination with the system topology illustrated on the signal flow drawings, the Contractor shall generate preliminary control surface layouts for all pushbutton panels, touch sensitive panels, PC based controllers or other control surfaces. The Contractor should endeavor to make the preliminary layouts as complete as possible. The layouts should illustrate all pushbuttons, labels, bar graphs, timers, video windows, etc. for each control panel and each system page. The Contractor should include suggestions for color schemes and graphics where applicable.

    c. It is recommended that control touch panel layouts conform to the InfoComm Dashboard for Controls Design Guide. This design guide is available on the InfoComm website at http://www.infocomm.org.

    d. The contractor shall receive written response indicating approval to proceed, or changes required to the control surfaces layouts, within 10 working days of receipt of the submittal by the Owner/Consultant.

3. Revised Preliminary Control Surfaces Submittal

    a. If changes are required to the preliminary control surfaces submittal, the contractor shall generate a revised preliminary control surfaces submittal to include the additions, changes or revisions generated by the preliminary submittal review. The form and quantity of the submittal shall be identical to the preliminary submittal unless otherwise directed. If the revised control surfaces submittal reflects those additions, changes or revisions called for in the preliminary submittal review, the contractor shall receive written approval to proceed within 10 working days of receipt of the submittal by the Owner/Consultant.

    b. The Contractor shall respond with the updated control surface submittal capturing all required changes indicated in the Owner/Consultant response within 10 working days of receipt of the response.

    c. A minimum of two control surface revisions shall be provided.

4. Post-Integration Adjustments

    a. If so requested by the Owner or Consultant, and within 90 days of system acceptance as outlined in 'System Acceptance', the Contractor shall be prepared to make two visits to the site to make final adjustments to the control system code or programming without additional compensation. This could include, but may not be limited to, renaming or changing the size or location of buttons, page flip calls, or adjustments to code to provide a fully functioning system. If engraved control system panels require modification at a cost to the Owner, such cost information must be submitted to the Owner for approval prior to any work being performed.

b. The Contractor shall be responsible for insuring that any changes to the control system or control surfaces that occur post integration are appended to the Final System Documentation.

C. Shop Drawings

1. The Contractor must receive written approval from the Owner prior to fabricating or installing any materials. Approval will be given based upon shop drawings. The shop drawings shall indicate complete details of work to be performed. The Contractor shall submit electronic copies of shop drawings to the Owner and Consultant for review and approval. Drawings shall include a title block naming the project, Owner and Consultant, and, shall include a drawing title, drawing number, revision number if applicable and date.

2. The shop drawings listed below are required of the Contractor. Provide electronic files and up to (1) paper set if requested by Owner or Consultant. Submit all Shop Drawings complete as a single submission. Isolated items will not be accepted, except with prior written approval.

a. Audiovisual Cut Sheets, sorted by space type with an overall equipment list identifying quantities, manufacturer, model and all accessories

1). Where multiple options or models are shown on a cut sheet, the project specific option or model shall be highlighted.

2). Equipment color options shall be highlighted for Architect confirmation with returned submittal.

3). Cut sheets shall NOT include installation manuals or manufacturer overall product line brochures.

b. Facility drawings, based on the Consultant's drawings, an updated set of floor plans, elevations and RCPs identifying all equipment locations, supporting infrastructure and cabling requirements.

c. System Signal Flow: Complete functional system signal flow of all systems described herein and meeting the functions indicated in the Specification.

d. Cabling Schedule: A list containing the cable type, cable marker identifier, and origination and destination location and connector types for each cable.

e. Examples representative of the Contractor's final cable marking technique for each cable type.

f. Loudspeaker Mounting Details: Scaled drawings of complete loudspeaker mounting details, hardware and support surfaces, including details on all load requirements, safety factors, safety cables and structural materials.

g. Projector Mounting Details: Scaled drawings of complete projector mounting details, hardware and support surfaces, including details on all load requirements, safety factors, and structural materials.

h. Structural Anchorage: Provide structural calculations, drawings and details for the anchorage of equipment racks, loudspeaker rigging hardware, the projector rail-mount system, and all other mounts or hardware that attach to structure. The design shall be reviewed and approved by a Structural Engineer licensed in the project state.

i. Optical Systems: Scaled drawings to verify that the proposed projection devices, lenses and related optical systems will provide the desired image size. The Contractor shall be responsible for field verification of the on-site conditions if required.

j. Panels: Scaled drawings of interconnect panels, control surfaces, and other custom interfaces.

k. Peripheral Equipment: Scaled drawings of mounting arrangements of any peripheral equipment, which may be included in this Specification.

l. Equipment Rack Layouts: Fully detailed rack drawings indicating equipment orientation within the equipment rack.

m. Technical Furniture: Scaled drawings of all technical furniture indicating dimensions, materials, finishes, equipment locations and orientation, cable management accommodations, and all other details necessary to convey the physical and functional aspects of the furniture.

n. Others, as may be required by the Architect, Consultant or Owner.

D. Labels / Wire Markers

1. Except where otherwise indicated, all rack-mounted equipment, switches, controls, and interface panels shall be clearly labeled.

a. Panels and plates shall be a minimum 1/8" thick anodized aluminum etched and epoxy filled unless otherwise specified.

b. Rack mounted equipment shall be labeled with engraved and filled plastic laminate. Where appropriate, the function of, or the input, output, or loudspeaker(s), served by each device shall be indicated. Other methods of labeling rack mounted equipment may be accepted pending prior written approval by Owner.

c. All cables shall be permanently identified at each end by machine printed cable markers and protected by the appropriate size clear shrink tubing. Every cable shall have a unique tag number identifier for each cable. The Contractor shall include this unique tag number on the As-Built signal flow documentation. Each cable marker shall include, in addition to the unique tag number identifier, the name of the origination and destination equipment termination at each cable end (see example below). Cable markers shall be placed two (2) inches from where the cable exits the strain relief of the connector, but never within a cable bundle.

2. Identification Panel

a. An identification panel shall be installed within the equipment rack including Contractor contact information. The panel shall be mounted in the top rack space.

3.2 CONTROL SYSTEM REQUIREMENTS

A. Control System User Interface

1. All panels are to have the time and date as icons, in the same position on every page.

2. All panels are to have a title, indicating the piece of equipment and/or functionality being controlled.

3. When a portable device is connected to the system while powered down the system shall be programmed to automatically wake and switch to the active input. Touch panels shall activate and switch to the local presentation page reflecting the active input used.

4. No individual component shall be programmed to function atypically.

5. Devices similar in nature shall be programmed to operate with a common format.

6. Pages for source equipment shall conform to the following guidelines:

a. Transport controls should be on the main device page.

b. The primary transport controls, <Play>, <Stop> and <Pause> should be larger than the other transport controls.

c. Buttons shall include both graphic images and text.

d. A button shall be included for a pathway to device specific controls, including menus and advanced device functions.

e. A button shall be included for a pathway to recording functionality. This shall include a single-bus control for the recording source.

7. Final programming shall include capability to remotely control all functions of the audiovisual system. Individual device controls shall provide full manufacturer's functionality.

8. Provide control capability for every function available on every piece of equipment being controlled by the system. Define and provide "macro" commands for the most used functions.

9. Provide control panel layouts that are consistent from page to page. Whenever the same button appears on more than one page, it will be in the same position on each page.

10. Functions used during a general presentation shall be accessible with a minimal amount of button presses/page flips.

11. All power functions, or other destructive commands, activated by the users through the user interface shall be intercepted in the programming. The user shall be provided with the opportunity to cancel out the command prior to any actions being initiated and without disturbing the current operating model.

12. Where feasible, multi-level access to controls should be implemented. All software shall provide multiple levels of password protection. Initially three levels of security will be established and specific rights to program areas shall be assigned by user:

a. Level 1 shall allow user to operate the system, without a password. Control shall be limited to basic functionality directly affecting the space in which the control is located.

b. Level 2 shall be password protected, and allow user to modify system parameters and features listed in level 1.

c. Level 3 shall be password protected, and allow a technician access to set-up functions, source selection, etc.

B. Control System Hardware

1. Provide remote control of systems with an integrated master controller, which provides ports for IR/serial, RS-232/422/485, Ethernet, relay closures and input and output control card frames and rack mounted, of all dedicated audiovisual components.

2. Unless where specified as Owner Furnished, provide all required network equipment, including, but not limited to, routers, hubs, gateways, media converters, etc., for integration of the networked AV Control system with the Owner's existing LAN and control system.

3. When a choice of control protocols is available for a piece of equipment, the most secure and flexible one shall be used; i.e. RS-232 control, where available, shall be used in place of either infra-red or relay control.

4. All equipment utilizing a "toggled" power command are not to be powered on and off from the control system.

C. Additional Control System Surfaces

1. Port all completed touch panel interfaces to web browser based control.

2. Port all completed touch panel interfaces to be fully mobile device compatible on Apple iOS or Android™ mobile devices.

3.3 INSTALLATION PRACTICES

A. General

1. All equipment shall be installed in accordance with this Specification, approved shop drawings, and manufacturer's recommendations.

2. All equipment with the exception of portable equipment shall be firmly fastened or attached in place. A safety factor of at least five or a published safe working limit shall be utilized for all brackets, fasteners and attachments. Provide safety retention cables for overhead equipment such as loudspeakers, projectors, etc.

3. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

4. The Contractor shall insure that all equipment is installed such that proper cooling and ventilation is insured.

5. All equipment shall be installed in a manner which prevents hum, RF/EMI/EMF interference, and mechanical vibration based noises (e.g. fan mounts, etc.)

6. Projectors, lenses, and mirrors shall be solidly mounted and braced so that there will be no observable movement in the image induced by motor vibration or other mechanical operations.

7. All equipment shall be protected from construction dust and debris until final acceptance of the system.

8. All equipment shall be protected from theft until final acceptance of the system.

9. Any equipment designed for use by end-users in the facilities must be installed with theft deterrence/protection mountings and fasteners. Any tools required to mount/un-mount this equipment must be furnished to the Owner at the date of Owner acceptance.

10. The Contractor shall be obligated to protect completed work and uncompleted work against damage or loss until the Owner has given final acceptance. Should the need arise to repair work or replace items the Contractor shall do so at no cost to the Owner.

B. Furniture

1. The Contractor shall ensure that equipment or mounting hardware is compatible with and suitable for installation in furniture specified by the Architect, Consultant, or furniture supplier. It shall further be the Contractor's responsibility to ensure that such coordination with the Architect, Consultant, or furniture supplier occurs.

2. The Contractor shall exchange with and follow such shop drawings as to ensure that dimensions and structural supports are adequate for the installation of specified equipment. It is the Contractor's responsibility that the request and delivery of such critical coordination information is satisfactorily executed. In as much as the Contractor has control over the delivery of such information, it shall deliver it as requested by the Architect, Consultant, or furniture supplier.

C. Equipment Racks and Equipment Rack Cable Management

1. Racks shall be installed in such a way so as to permit access to all equipment for service.

2. Racks are considered complete components and should be completely assembled and tested at the Contractors facility prior to onsite installation.

3. All equipment in racks shall be fitted with vent panels and/or fans as required to provide ventilation and cooling according to equipment manufacturer's recommendations.

4. Adjacent racks shall be bolted together with appropriate ganging hardware.

5. As a general practice, all power cables, control cables, and high-level cables shall be dressed to the left rear of an equipment rack. Audio and video cables shall be dressed to the right rear of the rack. Audio, video and control cables shall be bundled separately and spaced not less than three (3) inches apart.

6. Internal equipment rack cabling shall be supported by lacing strips, support brackets, or other cable management systems as required to ensure that all cabling is supported in both the vertical and horizontal planes within the rack.

7. With the exception of ganged equipment rack assemblies, cabling routed between equipment racks or pieces of equipment exterior to equipment racks, or extending to the greater facility cabling infrastructure, shall be completely protected, end-to-end, by a raceway, wire-way, or duct appropriately sized for the cable run.

8. Cabling between rolling pieces of equipment not housed in rack cabinets or a rolling equipment rack and any device to which it is connected, shall be protected by a split-loom corrugated tubing wrap or other such flexible cable management system appropriately sized for the cable run.

9. Any controls not to be adjusted by the user and accessible from the front of the equipment rack must be furnished with security panels.

3.4 CABLING

A. CABLING TYPES

1. Refer to the Audiovisual drawing package for minimum audiovisual low-voltage cabling requirements.

2. Coordinate UTP and Fiber Optic cable types with Information Technology (IT) requirements and submit UTP cable for approval by Owner and Consultant.

B. CABLE INSTALLATION

1. Non-contiguous cable support mechanisms such as hangers, rings, and hooks shall not be spaced farther than four (4) feet apart. All manufactured raceways used for cables shall be installed according to the raceway manufacturer's specifications

2. Cable runs shall be supported with devices designed for this purpose and are to be installed independent of any other structural component.

3. Cables routed vertically up walls, or between floors as vertical riser, shall be supported with clamps or other mechanisms. These supports shall occur at least three times per floor.

4. The Contractor shall maintain, or where not already existing, provide through penetration fire stop systems to prevent the spread of fire through openings made in fire-rated walls or floors to accommodate penetrating items such as conduit, cables or other pathway. Fire stop shall restore floor and wall to the original fire rated integrity and shall be waterproof. The fire stop

systems and products shall have been tested in accordance with the procedures of U.L. and material shall be U.L. classified as materials for use in through-penetration fire stops.

5. The fire stop system shall comply with the NEC and with NFPA 101-Life Safety Code (latest edition) and shall be made available for inspection by the local inspection authorities prior to cable system acceptance. The contractor shall be responsible for verifying the fire rating of all walls and floors affected by his work.

6. Cable pulling tension may not exceed manufacturer recommendations. Where cable-pulling lubricant is used, the lubricant must be compatible (non-damaging) with the conduit and cable sleeve materials and must not harden over time to prevent future pulls.

7. Cable stapling of any recognized media type shall not be permitted.

8. Cables shall be dressed in conveniently sized bundles and either laced or banded. Lacing or banding shall not be so tight as to deform cable bundles.

9. Cabling installed with a bend radius less than that recommended by the cabling manufacturer is not acceptable.

10. Cables and bundles terminating at equipment or connector panels shall be supported so as not to put strain on connections or connectors.

11. All cables, with the exception of video or pulse cables, which must be cut to an electrical length, shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior approval of the Consultant.

12. Cabling for equipment mounted in drawers or on slides shall be provided with a service loop of appropriate length. A cable management support for the service loop shall be provided to prevent the service loop travel from interfering with the operation of the drawer or slide, or snagging on adjacent cabling.

13. Where indicated on the Audiovisual Drawing Set microphone level, line level, loudspeaker level, and video lines shall be run in separate conduits, trough, raceway divider, and cable bundles. Low voltage DC and control may be run along with any signal types other than microphone or line level runs.

C. TERMINATION

1. All termination components must meet or exceed all specifications for given media type and application as described in this document and system drawings.

2. Crimp on connectors shall be installed only on the appropriate size cable using the manufacturer recommended crimp tool and die set.

3. Connections to electronic devices providing screw terminals shall be terminated using the appropriate gauge insulated spade or ring crimp terminal connector and crimp tool.

4. All mechanical solder-on connectors shall be attached to cable ends using rosin core solder.

5. Audio signal cable shields shall be protected with the appropriate gauge Teflon or heat-shrinkable tubing. The jacket end of each audio cable shall be fitted with the appropriate gauge heat shrinkable tubing to provide additional protection to the base of the shield or shield foil. This also applies to the inside of mechanical connectors and cables that terminate at partitioned barrier strips.

D. AV Over UTP Cabling System

1. In some areas, analog video, audio, and control signals will be transmitted over a dedicated system of unshielded twisted pair (UTP) cabling utilizing specialized electronics. UTP transceivers located in the presentation spaces will connect to similar devices in the equipment racks via a cabling scheme comprised of RJ-45 receptacles, permanently installed cabling, equipment cords, and patch cords and patch panels.

2. Each AV over UTP port receptacle, permanently installed cable, equipment cord, patch cord and patch panel will be of a color or have markings that are non-standard with the voice/data system, and be plainly and permanently labeled (AV ONLY - NOT DATA).

3. To eliminate the problem of skew caused by the varying pair lengths inherent with CAT-5e/6 UTP cabling, a specialized skew-free UTP bulk cable, patch cables, and equipment cords are specified.

4. The Contractor shall test, verify and document the length and wire map of each Permanent Link cable run, each patch panel to transceiver cable segment, and each patch and equipment cord using a Fluke model 620 LAN Cable Meter or equivalent.

E. Grounding

1. General

a. To avoid system noise, data errors, safety hazards, and equipment damage, all devices and cabling shall be installed using a consistent grounding scheme. All devices shall be grounded and all ground conductors shall follow a star topology. The grounding system topology should be such that each equipment rack and each piece of signal bearing equipment is connected so that there is never more than a single path to ground. This section offers guidelines for grounding and shielding methodology. Grounding and shielding methodology may need to be augmented or modified for certain pieces of equipment or interconnections in order to meet the requirements of other sections of this specification. The Contractor shall be responsible for making necessary alterations in accordance with industry practices and such that the Performance Standards detailed in 'Performance Standards' are met.

b. Under no circumstances shall an AC neutral conductor be used to ground equipment.

c. Refer to the International Communications Industries Association, Inc. (InfoComm International) Basics of Audio and Visual Systems Design handbook, Section 10, Technical Power and Grounding Systems for additional guidelines.

2. Interconnection

a. All connectors used on system I/O panels shall be electrically isolated from the panel and provide a pass through (uninterrupted) ground connection.

b. Microphone cable shields shall be connected to the microphone frame and grounded only at the preamplifier input connector.

c. All audio interconnections with cable lengths greater than 10 feet shall use balanced (symmetrical) signaling.

d. All audio signal cable shields shall be grounded only at the input connection of each device. Signal cable shields, both connected to devices and floating, shall be protected by the appropriate gauge heat shrinkable tubing. Shields at the output connector shall be folded back over the cable jacket and covered with heat-shrinkable tubing. Do not cut off unused shields.

e. Coaxial video and RF shields shall be connected at both ends.

3. Pull Strings

a. A nylon pull string shall be left in every conduit. In the event additional cables are pulled in after the initial cable pull, a nylon pull string shall be pulled with the added cable.

3.5 PERFORMANCE STANDARDS

A. Audio

1. Polarity

a. Absolute signal polarity will be maintained throughout the signal chain such that a positive signal at the input produces a corresponding positive excursion at the loudspeakers.

2. Electronics

a. The audio system electronics shall deliver the following minimum performance standards as measured from all source inputs for microphones, audio tape machines, video tape machines, etc., through all mixers, audio distribution amplifiers, routers, etc., to all audio signal destinations.

b. Frequency Response: ±0.5dB, 20-20,000 Hz.

c. Hum and Noise: -70 dBu, 20-20,000 Hz, un-weighted.

d. Distortion: 0.1% THD, 20-20,000 Hz

3. Speech Signal

a. (a) The system shall provide a speech signal in the audience seating area that meets or exceeds the following requirements:

1). Frequency response within +/- 3 dB from 500 Hz to 15,000 Hz.

2). Overall SPL variance of +/- 3 dB.

3). Measured Alcons of 10% or lower.

4). Maximum average SPL of 85 dB (flat), with 10 dB of undistorted headroom available.

4. Music Signal

a. The system shall provide a music signal in the audience seating area that meets or exceeds the following requirements:

1). Frequency response within +/- 3 dB from 200 Hz to 17,000 Hz.

2). Overall SPL variance of +/- 3 dB.

3). Maximum average SPL of 90 dB (flat), with 10 dB of undistorted headroom available.

B. Optical

1. All video projection systems shall meet the following performance standards:

a. The total averaged light output from a video projector, in ANSI lumens, shall be tested by the Contractor and certified to be within ±15% of that specified by the projector manufacturer.

b. All video projection systems shall be measured by the Contractor using ANSI/INFOCOMM 3M-2011 Projected Image System Contrast Ratio and documented for Owner and Consultant review.

3.6 SYSTEM SETUP AND TUNING

A. Optimization

1. The Contractor shall install, configure, adjust, program, and calibrate all components in order to optimize the performance of all individual subsystems and the system as a whole.

B. Preliminary Tests and Submittals

1. General

a. Once the system is installed, the Contractor shall complete the following preliminary tests and prepare a written test report for the Owner and Consultant. The test report will list the results of each of the tests described in this section and certify that the installation is complete

2. Testing Format and Requirements

a. Sign-off documentation format will be provided to the contractor in advance of initial shop testing and will follow the ANSI/INFOCOMM 10:2013 Audiovisual Systems Performance Verification standard format.

b. A full ANSI/INFOCOMM 10:2013 review and validation of one (1) example of each system type documented by the Contractor will be required.

c. Subsequent system type reviews will include overall capabilities evaluations. Noted punch list items will be referenced to their ANSI/INFOCOMM 10:2013 equivalent.

d. Where significant defects are noted in the subsequent system type reviews, the Owner and Consultant may elect to require Contractor to document to the full ANSI/INFOCOMM 10:2013 standard and remedy all deficiencies noted.

3.7 FINAL TESTS

A. Upon approval of the Contractor's test report, and at a time that is mutually acceptable to the Contractor Owner and Consultant, the Contractor shall assist the Consultant in final system tests and adjustments. The Contractor's representatives assisting in the performance of these tests shall be thoroughly familiar with the details of the system and shall include the field supervisor responsible for installing the system.

B. To demonstrate the good working order of all playback devices in the system the Contractor shall make available high quality source materials for all audio and video media types represented in the system. To demonstrate the good working order of all computer-video displays the Contractor shall make available the computer-video signal generator described in 'Performance Standards - Preliminary Tests and Submittals - Computer Video Display Devices'. In addition, the Contractor shall make available a computer graphics signal generator or portable computer with the ability to output all video formats natively supported by the audiovisual system specified. The portable computer shall be capable of displaying spreadsheets, graphs, charts, pictures and text of varying sizes and fonts to effectively demonstrate the systems computer display imaging capabilities.

C. The Contractor shall:

1. Load source material into all input sources and the laptop computer.

2. Switch randomly between all sources and demonstrate that all functions of the control system are working properly and tracking correctly.

3. Demonstrate that the displays have been optimized for all sources.

4. Demonstrate that the system meets the criteria as outlined in 'Performance Standards'.

3.8 FINAL DOCUMENTATION

A. Upon completion of the work, the Contractor shall condense the master set along with any shop drawings into a single As Built document set. Any markings or deviations, which cannot be made clear on drawings, shall be accompanied by attached documentation, photos, or written addenda.

B. All documents and drawings must be submitted electronically in their native AutoCad and PDF format. Further, all PDF drawings must be submitted at their native scale. For example, a PDF created from a drawing whose native format was standard 'E' size (42-inch x 30-inch) shall be created at 42-inch x 30-inch (full size) to insure that there is no loss of resolution should the file be viewed or printed at a later date by the Owner.

C. Final submission of digital As Built drawings files shall be subject to submission by the Contractor as defined under said agreement.

1. Preliminary Final Documentation Submittal

a. Prior to Final Tests and project punch-listing, the Contractor shall prepare and submit one (1) copy of the documentation listed below to the Consultant and owner for review. The package shall include all of the documentation listed below and be in the exact form and format intended for delivery to the Owner.

b. The documentation shall be in electronic format AutoCad and PDF file format copies and organized as follows:

1). A cover and spine listing the Owner, Consultant, and Contractor.

2). A listing of each supplied item with manufacturer, model number and serial number.

3). Operator's manuals for each piece of equipment supplied by the Contractor arraigned by system type.

4). A complete set of as-built drawings. The as-built drawings must reflect all changes to the system(s) made after the original bid documentation. The size of the as-built drawings shall be identical to the original drawings provided to Contractor, folded and inserted into the binders in plastic sleeves. Alternative formats may be acceptable upon prior approval by the Consultant and Owner.

2. Final Documentation Submittal

a. Following successful completion of Final Tests and punch-listing, the Contractor shall prepare and submit to the Consultant and Owner electronic copies of the documentation listed under the Preliminary Final Documentation Submittal. The Final Documentation Submittal will include any and all adjustments or changes identified during the Preliminary Final Documentation Submittal review.

b. The documentation shall contain PDF file-format copies for items 1 through 4 in Section A above and include detailed digital photographs showing the front views of all equipment racks. The photographs shall accurately reflect equipment front-panel settings at the time of project sign-off. All photographs must be properly exposed and

focused, clearly showing the final settings for every device's push buttons, rotary controls, slider controls, or indicators. Subject areas must be free from glare as a result of flashes or other ambient lighting. Subject areas shall fill the image frame in a suitable manner. For large equipment racks, multiple exposures may be required, each indicating a separate portion of the rack. NOTE: All digital images shall be comprised of at least 1600 x 1200 viewable pixels, 24-bit color depth, JPEG file format.

3. Software

a. Where custom software is developed as part of this project, the system source code and any associated related files, referenced files, and development software (and all relevant documentation and license) used to compile, develop, and build, etc. the executable code must be provided to the Owner only. The source code should be well documented in accordance with industry software engineering practices.

b. The software developer shall retain intellectual property rights; the Owner shall have a license for perpetuity for use as it applies solely to this project, including the right to modify/enhance. The software code may not be sold or used, in part or in whole, in any other project or application other than that intended by this specification, in part or in whole, by the Owner or any other party.

c. If a Subcontractor is used to write the software, the Contractor shall include, as part of the Final Documentation submittal, a signed letter on Subcontractor letterhead, granting the Owner ownership, use, and modification rights of the code and documentation as defined herein. The software shall be provided to the Owner as part of the Final Document Submittal.

d. Copies of all manufacturer software required to program, compile, load and adjust audiovisual hardware settings or programming shall be provided.

e. Copies of the current firmware and/or hotfix versions for all equipment with programmable firmware.

4. Delivery & Approval

a. Unless otherwise arranged, The Contractor shall prepare and submit one complete set of the Final Documentation to the Consultant for review at the time of Final Tests. The package shall include all of the documentation listed above and be in the exact form and format intended for delivery to the Owner.

b. If the Final Documentation submittal is determined by the Consultant to be complete and accurate, the Consultant will approve the submittal and forward the Final Documentation package to the Owner.

c. If the Final Documentation submittal is determined by the Consultant and/or Owner to not be complete and/or accurate, the Consultant will return the package to the Contractor with a written listing of the required modifications. Upon completion of all of the required modifications, the Contractor shall resubmit the Final Documentation to the Consultant and Owner for approval. The Final Documentation submittal shall not be considered to be complete until all required modifications have been made and approved by the Consultant and Owner.

3.9 TRAINING

A. The Contractor shall provide a minimum of (40) hours of on-site training for (but not limited to) the Owner's staff at a time that is mutually agreeable for the Owner and Contractor.

B. The Contractor shall provide an additional minimum of ( ) hours of content system initial template layouts, training and configuration.

C. Contractor shall provide (2) additional day(s) for system walk thus etc. at the request of the Owner and/or Consultant.

D. The Owner may choose to have the sessions spread out over a period of time and vary the staff being trained and the level of training. Final acceptance and/or final payment for the system shall not be delayed due to scheduling delays beyond the control of the Contractor. Contractor, should also be available for requested additional training.

E. As part of user training Contractor shall provide single page laminated room use cards for all rooms and tailored to each specific room type. Room card shall include:

1. Simple instructions for basic user functions (system on, off, media, making VTC & ATC calls).

2. Help desk contact information.

3. Room type capabilities (presentation, VTC, ATC, etc.)

4. Electronic version of the room use cards shall be provided to the Owner two weeks prior to move-in to allow for Owner formatting and review.

3.10 ONSITE SUPPORT STAFF

1. For the period of 3 days the Contractor shall provide (1) staff member onsite week days from 9am to 5pm to help support Owner move-in, administrative staff training, ongoing system troubleshooting and adjustment.

2. The staff member provided shall be familiar with the installation and operation of the system specified and shall have been onsite with the installation team at least two weeks prior to Owner move-in.

3.11 SYSTEM ACCEPTANCE

A. Upon successful completion of Final Tests, Documentation and Training, the Contractor shall notify the Owner, in writing, that the system is complete which notification shall be accompanied by consultant's continuation of completion. The Owner shall have fifteen (15) days to generate a punch list of omissions, adjustments, corrections and the like and respond in writing to the Contractor. In the absence of such a Punch List, the system shall be considered to be complete. The warranty shall commence on the day after Owner shall have conformed, in waiting, that the work has been completed in accordance with the requirements of the contract documents or, if Owner fails to provide such written confirmation, or the Punch list, within each fifteen (15) day period, on the fifteen day after the Contractor's notification of completion of work (accompanied by consultant's confirmation), and the Owner thereupon shall process final payment. In the event that further work is required to complete this project, the Contractor shall be prepared to continue work, without additional compensation, until the system is accepted.

END OF SECTION 27 41 16

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 274116.01

AUDIO-VISUAL EQUIPMENT LIST

Cerami Associates, Inc.
404 Fifth Avenue, New York, NY 10018
T 212 370 1776 F 212 370 1736

Equipment Racks **21-Nov-24**

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Rack Mount Monitor	Marshall	V-LCD173HR				$ -	
	Video Sources							
2	OFE Computer	O.F.E.	T.B.D.				$ -	
3	USB Keyboard/Mouse	Middle Atlantic	T.B.D.				$ -	
4	OFE CATV Tuner	OFE	T.B.D.				$ -	
	Video Distribution							
5	Video Encoder/Decoder	QSC	Q-SYS NV-32-H	see quote Q-35040-20231006-1437			$ -	
6	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -	
7	Video Wall Processor	Planar	VC4	See Quote # 00118900-2			$ -	
8	Format Converter	Planar	EXT-FIB-CAT	See Quote # 00118900-2			$ -	
9	AV Receiver/ Scaler w/ Audio Downmix	Crestron	DM-RMC-4K-SCALER-C-DSP				$ -	
10	AV Transmitter - 8G+	Crestron	DM-TX-201-C				$ -	
	Audio System							
11	Audio DSP - Qsys Unified Core	QSC	Core 610	see quote Q-35040-20231006-1437			$ -	
12	Network Power Amplifier	QSC	CX-Q 2K4	see quote Q-35040-20231006-1437			$ -	
13	Network Switch	O.F.E.	T.B.D.				$ -	
	Control Systems							
14	10" Touch Panel	QSC	TSC-101-G3	Rack Mount Required			$ -	
15	LAN to 4 IR	QSC	QIO-IR1x4	see quote Q-35040-20231006-1437			$ -	
16	Licenses	QSC	Deployment Software	see quote Q-35040-20231006-1437			$ -	
17	Licenses	QSC	Scripting Software	see quote Q-35040-20231006-1437			$ -	
18	Programming	QSC	Pro Services	QSC will do all the control programming including GUI, DSP, IP Video, Display Controls, … Current price is an estimate, quote PS-022514			$ -	
	Racks/Misc							
19	Equipment Rack	O.F.E.	T.B.D.	The client will ship the racks to the AV vender for fabrication, and QA/QC. One rack is for future expansion.			$ -	
20	Rack internal power management	Middle Atlantic	UPS-OL2200R				$ -	
21	Rack internal power management	Middle Atlantic	UPS-OLIPCARD				$ -	
22	Rack internal power management	By AV Contractor	By AV Contractor				$ -	
23	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

PSAP 21-Nov-24

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 65"	Planar	URP65					
2	Flat Panel Display - 98"	Planar	URP98					
3	Display Mount	Chief	MTM1U					
4	Display Mount	Chief	XTM1U					
5	In-Wall Back Box	Chief	PAC527L					
	Video Distribution							
6	Video Encoder/Decoder	QSC	Q-SYS NV-32-H	see quote Q-35040-20231006-1437				
7	Video Encoder/Decoder	QSC	Q-SYS NV-21-H					
8	HDMI DA	Extron	DA2 HD 4K PLUS					
	Audio System							
9	Ceiling Speaker	QSC	AD-C6T-LP	see quote Q-35040-20231006-1437				
	Control Systems							
10	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437				
	Racks/Misc							
11	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor					
							EQUIPMENT SUB-TOTAL	

EOC 21-Nov-24

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	LED Video Wall	Planar	6X6 TVF 1.2 V2	See Quote # 00118900-2			$ -	
2	Flat Panel Display - 98"	Planar	URP98				$ -	
3	Display Mount	Chief	XTM1U				$ -	
4	In-Wall Back Box	Chief	PAC527L				$ -	
	Video Distribution							
5	Video Encoder/Decoder	QSC	Q-SYS NV-32-H	see quote Q-35040-20231006-1437			$ -	
6	Video Encoder/Decoder	QSC	Q-SYS NV-21-H				$ -	
7	HDMI DA	Extron	DA2 HD 4K PLUS				$ -	
	Audio System							
8	Ceiling Speaker	QSC	AD-C6T-LP	see quote Q-35040-20231006-1437			$ -	
	Control Systems							
9	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -	
	Racks/Misc							
10	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

TRAINING ROOM								21-Nov-24
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 65"	Planar	URP65				$ -	
2	Desk Top Computer Monitor	O.F.E.	T.B.D.				$ -	
3	Display Mount	Chief	MTM1U				$ -	
4	In-Wall Back Box	Chief	PAC527L				$ -	
	Video Sources							
5	HDMI DA	Extron	DA2 HD 4K PLUS				$ -	
	Video Distribution							
6	Video Encoder/Decoder	QSC	Q-SYS NV-32-H	see quote Q-35040-20231006-1437			$ -	
7	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -	
	Audio System							
8	Ceiling Speaker	QSC	AD-C6T-LP	see quote Q-35040-20231006-1437			$ -	
	Control Systems							
9	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -	
	Racks/Misc							
10	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

Command Room								21-Nov-24
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 55"	Planar	URP55				$ -	
2	Flat Panel Display - 85"	Planar	URP85				$ -	
3	Display Mount	Chief	MTM1U				$ -	
4	Display Mount	Chief	XTM1U				$ -	
5	In-Wall Back Box	Chief	PAC527L				$ -	
6	In-Wall Back Box	Chief	PAC526				$ -	
	Video Conferencing Systems							
7	All in One Sound Bar	Poly	X52				$ -	
8	Touch Panel	Poly	TC10				$ -	
	Video Sources							
9	Wireless Presentation	Barco	CX50				$ -	
	Video Distribution							
10	Video Encoder/Decoder	QSC	Q-SYS NV-32-H	see quote Q-35040-20231006-1437			$ -	
11	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -	
12	USB Extender	Icron	Raven 123				$ -	
13	USB Auto Switch	Inogeni	Toggle				$ -	
	Control Systems							
14	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -	
	Racks/Misc							
15	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

Office 3 displays 21-Nov-24

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 49"	Planar	URP49				$ -	
2	Display Mount	Chief	MTM1U				$ -	
3	In-Wall Back Box	Chief	PAC526				$ -	
	Video Sources							
4	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -	
	Audio System							
5	Sound Bar	Yamaha	SR-C20A				$ -	
	Control Systems							
6	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -	
	Racks/Misc							
7	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

G.I.S. OFFICE 21-Nov-24

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 85"	Planar	URP85				$ -	
2	Display Mount	Chief	XTM1U				$ -	
3	In-Wall Back Box	Chief	PAC527L				$ -	
	Video Projector							
4	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -	
	Audio System							
5	Sound Bar	Yamaha	SR-C20A				$ -	
	Control Systems							
6	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -	
	Racks/Misc							
7	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -	
							EQUIPMENT SUB-TOTAL	

OFFICES AND LUNCH RM 21-Nov-24

ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
	Video Displays							
1	Flat Panel Display - 49"	Planar	URP49					
2	Display Mount	Chief	MTM1U					
3	In-Wall Back Box	Chief	PAC526					
	Video Distribution							
4	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437				
	Audio System							
5	Sound Bar	Yamaha	SR-C20A					
	Racks/Misc							
6	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor					
							EQUIPMENT SUB-TOTAL	

CONFERENCE ROOM							21-Nov-24
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST
	Video Displays						
1	Flat Panel Display - 85"	Planar	URP85				$ -
2	Display Mount	Chief	XTM1U				$ -
3	In-Wall Back Box	Chief	PAC527L				$ -
	Video Conferencing Systems						
4	All in One Sound Bar	Poly	X52				$ -
5	Touch Panel	Poly	TC10				$ -
	Video Sources						
6	Wireless Presentation	Barco	CX50				$ -
	Video Distribution						
7	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -
8	USB Extender	Icron	Raven 123				$ -
9	USB Auto Switch	Inogeni	Toggle				$ -
	Control Systems						
10	10" Touch Panel	QSC	TSC-101-G3	see quote Q-35040-20231006-1437			$ -
	Racks/Misc						
11	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -
						EQUIPMENT SUB-TOTAL	

BRIEFING							21-Nov-24
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST
	Video Displays						
1	Flat Panel Display - 65"	Planar	URP65				$ -
2	Display Mount	Chief	MTM1U				$ -
3	In-Wall Back Box	Chief	PAC527L				$ -
	Video Sources						
4	Wireless Presentation	Barco	CX50				$ -
	Video Distribution						
5	Video Encoder/Decoder	QSC	Q-SYS NV-21-H	see quote Q-35040-20231006-1437			$ -
	Audio System						
6	Ceiling Speaker	QSC	AD-C6T-LP				$ -
	Control Systems						
7	5" Touch Panel	QSC	TSC-50-G3	see quote Q-35040-20231006-1437			$ -
	Racks/Misc						
8	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor				$ -
						EQUIPMENT SUB-TOTAL	

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 280500
COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:

   a. Grounding and bonding for Electronic Safety and Security (ESS).
   b. Pathways for ESS.
   c. Lightning and Surge Protection for ESS.
   d. Vibration and Seismic Controls for ESS.
   e. Equipment Enclosures for ESS.
   f. Electronic Components for ESS.
   g. Exposed Components.
   h. Cables for ESS.
   i. Identification for ESS.
   j. Electronic Safety and Security (ESS) equipment coordination and installation.

2. Provide labor, materials, and equipment necessary to complete the work of the Electronic Safety and Security (ESS) Systems, including but not limited to the following:

   a. Installing and Integrating the new Access Control Panels and devices to the Access Control and Alarm Monitoring System (ACAMS) and Video Surveillance System (VSS).
   b. Intrusion Detection System
   c. Wireless Duress system
   d. Local Area Network (LAN) switches
   e. Install and Integrate Camera's into the Video Surveillance System (VSS), upgrade the VSS for the additional cameras being added to the system.
   f. Associated cabling, enclosures, power supplies and uninterruptible power supplies.
   g. Coordination:
      1) Coordination with door hardware vendor
      2) Coordination with the Telecommunication vendor
      3) Coordination and interface with the fire alarm system to tie the electrified locks power supplies to the building fire alarm.
      4) Coordination with other trades

1.2 RELATED DOCUMENTS

A. Division 00 Section "Procurement & Contracting Requirements Group"

B. Division 01 Section General Requirements"

C. Division 07 Section "Fire and Smoke Protection"

D. Division 08 Section "Door Hardware"

E. Division 08 Section "Door Schedule"

F. Division 26 Section "Cable Trays for Electrical Systems"

G. Division 26 Section "Identification for Electrical Systems"

H. Division 26 Section "Grounding and Bonding for Electrical Systems

I. Division 26 Section "Hangers and Supports for Electrical Systems"

J. Division 26 Section "Vibration and Seismic Controls for Electrical Systems

K. Division 26 Section "Overcurrent Protective Device Coordination Study"

L. Division 26 Section "Raceway and Boxes for Electrical Systems"

M. Division 27 Section "Communications Backbone Cabling"

N. Division 27 Section "Communications Equipment Room Fittings"

O. Division 28 Section "Access Control and Intrusion Detection"

P. Division 28 Section "Electronic Surveillance"

1.3 ABREVIATIONS AND DEFINITIONS

A. Abbreviations

ACAMS	Access Control Alarm Monitoring System
ACP	Access Control Panel
ACS	Access Control Server
AFF	Above Finished Floor
ANSI	American National Standards Institute
AWG	American Wire Gauge
BL	Blue Light
BLS	Blue Light Switch
BMS	Balanced Magnetic Switch
CB	Crash Bar
CPU	Central Processing Unit
CR	Card Reader
DB	Duress Button
DC	Door Contact
EI	Electric Integrated door lock set
EIA	Electronic Industries Alliance
EL	Electronic Lock
ES	Electronic Strike
ESS	Electronic Safety and Security
FA	Fire Alarm (relay designator)
FCC	Federal Communications Commission
Fps	frames per second
GB	Glass Break
GUI	Graphical User Interface
IDP	Intrusion Detection Panel
IDS	Intrusion Detection System

ISC	Intelligent System Controller
iSCSI	Internet Small Computer Systems Interface
IC	Intercom (Analog)
IP	Internet Protocol
KP	Keypad (either Alarm or Card Reader)
LAN	Local Area Network
LPS	Lock Power Supply
Mbps	Megabits per second
MC	Magnetic Contact
MHz	Megahertz
ML	Magnetic Lock
MS	Motion Sensor
NIC	Network Interface Card
NVR	Network Video Recorder
PS	Power Supply
RMS	Rack Mount Space (1.75")
RU	Rack Unit (1.75")
RAID	Redundant Array of Independent Disks
RAID0	Block Level Striping without Parity or Mirroring
RAID5	Block Level Striping with Distributed Parity
SCP	Security Control Panel
SCS	Structured Cabling System
SDK	Software Development Kit
SSA	Software Support Agreement
SMS	Security Management System
TB	Terra Bytes
TCP/IP	Transmission Control Protocol / Internet Protocol
UL	Underwriters Laboratories
UPS	Uninterrupted Power Supply
UTP	Unshielded Twisted Pair
VI	Video Intercom (IP)
VSS	Video Surveillance System
WAN	Wide Area Network
WKST	Workstation (Video, or Alarm)

B. Definitions

1. "Provide" shall mean furnish and install.
2. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.
3. "Concealed" shall mean hidden from sight in chases, furred spaces, shafts, embedded in construction or in crawl space.
4. "Exposed" shall mean not installed underground or concealed as defined above.

5. "Furnished by others" shall mean materials or equipment purchased and set-in place under other sections of the general contract and connected to the systems covered by this section of the specifications by this trade contractor.
6. "Coordinate" shall mean all work provided under this section of the specification shall follow work of other trades.
7. "Demonstration" shall mean the verification by operation, movement or adjustment of an item or system and the comparison of the item or system performance against a qualitative standard, or standards as set forth in the specific requirements of the cited paragraph.
8. "Test" implies the systematic exercising of an item or system under all specified conditions with quantitative measurement of specified parameters and comparison of performance against the quantitative standards set forth.
9. Base Design/System: The intent of this phrase(s) is to describe the security and video systems specified herein, without regard or reference to the alternates appended to this document. The base design and base system present minimum acceptable performance levels and the Owner's desire to provide priority consideration to the most economic security system that meets these performance levels.
10. Security Contractor: This term designates the company which conducts the Work and is responsible to ensure that others provide specified Work as described in the Specifications for security systems. This term specifically refers to a company that is qualified to perform the Work specified herein related to the integration of all electronic security access control systems and components and the fabrication and installation of all security equipment.
11. Electrical Contractor: The Electrical Contractor shall furnish and install all security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, cable ladders, plywood backboard and other associates mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors. In addition, the Electrical Contractor shall have installed the electrical power for the security system. The Electrical Contractor shall refer to the electrical drawings and electrical specifications for installation requirements.
12. Door Hardware Contractor: The Door Hardware Contractor shall provide materials and services for all door hardware, door frames, and mechanical locking hardware.
13. Door/Frame Security Hardware Package: This term signifies the security hardware package associated with a security access controlled and/or alarm monitored door. Security door hardware includes an electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, magnetic lock, power supplies, termination cabinets, and final connection of wiring to door security devices and to the appropriate screw terminals on the screw-type termination strips located in the termination box.

1.4 STANDARDS AND CODES

A. Ensure that the design and fabrication of the equipment is in accordance with applicable engineering codes and standards. When specific requirements are stated in this Section that exceed and/or overlap those requirements of the codes and standards referenced here, this Section shall govern.

B. Ensure compliance with all applicable prevailing codes and laws within the jurisdiction of the site as applicable to the extent of this section.

C. Provide a completely fully operational turnkey security system as specified within these documents.

D. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The most current version of the following standards shall be referenced.

1. American National Standards Institute (ANSI) Publications:
   a. National Electrical Safety Code
2. American Society for Testing and Materials (ASTM) Publications:
   a. Standard Practice for Security Engineering Symbols
3. National Fire Protection Association (NFPA) Publications:
   a. National Electrical Code
4. National Electrical Manufacturers Association (NEMA) Publications:
   a. Industrial Control Devices and Assemblies.
   b. Enclosures for Industrial Controls and Systems
   c. Enclosures for Electrical Equipment
5. Telecommunications Industry Association/Electronic Industries Alliance
   a. ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises
   b. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard
   c. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard
   d. ANSI/TIA-568.3-D, Optical Fiber Cabling And Components Standard, Ed. D
   e. ANSI/TIA-568-C.4, Broadband Coaxial Cabling and Components Standard, Ed
6. Underwriters Laboratories, Inc., Standard for Safety:
   a. UL 5 Surface Metal Raceways and Fittings
   b. UL 6 Rigid Metal Conduit
   c. UL 50 Cabinets and Boxes
   d. UL 65 Electric Wired Cabinets
   e. UL 83 Thermoplastic-Insulated Wires
   f. UL 96 Lightning Protection Components
   g. UL 193 Fuses
   h. UL 294 Access Control System Units
   i. UL 437 Key Locks
   j. UL 444 Communication Cables
   k. UL 486A/B Wire Connectors and Soldering Lugs
   l. UL 493 Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables
   m. UL 497B - Protectors for Data Communication and Fire Alarm Circuits
   n. UL 512 Fuse Holders
   o. UL 514B Boxes, Fittings for Conduit and Outlets
   p. UL 603 Power Supplies for Use with Burglar-Alarm Systems
   q. UL 609 Local Burglar Alarm Units and Systems
   r. UL 611 Central-Station Burglar-Alarm Systems
   s. UL 632 Electrically Actuated Transmitters
   t. UL 634 Connectors and Switches for Use with Burglar Alarms Systems
   u. UL 639 Intrusion Detection Units
   v. UL 651 Conduit, Schedule 40' and 80' Rigid PVC
   w. UL 796 Electrical Printed Wiring Boards
   x. UL 797 Electrical Metallic Tubing
   y. UL 827 Central Stations for Watchman, Fire-Alarm, and Supervisory Services

z. UL 1037 Anti-theft Alarms and Devices
aa. UL 1076 Proprietary Burglar Alarm Units and Systems
bb. UL 1773 Boxes, Termination

7. Applicable Federal, state, and local laws, regulations, ordinances, and codes.
8. Nothing in this Section, including revocation of certain specific codes, standards, or specifications, shall relieve the Security Contractor of the responsibility for compliance with the codes, standards or specifications which are generally recognized to be applicable to the work specified herein.

1.5 SUBMITTALS

A. General Procedures

1. All submittals shall comply with the requirements of Division 01.
2. Do not commence work that requires review of any submittals until receipt of returned submittals with appropriate final action.
3. Submittals that deviate from the procedures outlined herein will be rejected. No allowance or extension of project time will be considered due to lost time associated with procedural deviation.
4. Do not submit substitute items that have not been approved.
5. Preparation and Transmittal of Submittals:

a. Transmit each submittal with a transmittal form. Submittals received without a transmittal form may be returned without action. The transmittal form shall include project name and address, number and date of submittal, name, and address of the issuing entity.
b. Sign or initial each copy of each submittal to certify compliance with requirements of the Contract Documents.
c. Submittals shall include a Table of Contents listing all items included and relevant references to contract documents. For product data sheets the table of contents shall include product name and manufacturer, page number of the corresponding specification section.
d. Product data sheets shall be grouped according to the specification's sections. Submittals shall include relevant information only. Product being submitted shall be clearly identified.

6. Timing of Submittals

a. Prepare and transmit each submittal requiring approval sufficiently in advance of scheduled performance of the related work to allow for adequate review and processing time, including time for re-submittal if necessary.
b. If processing time for a submittal will be critical to progress of the work, advise and notify the Owner or its representatives accordingly.

B. List of Submittals:

1. Pre-Construction Submittals:

a. Quality Assurance (QA) Plan
b. Qualifications and Certificates
c. Materials and Equipment List
d. Product Data for every product installed.
e. Manufacturer Quality Assurance Tests and Source Quality Control Reports
f. Shop Drawings
g. Samples

2. During Construction:

    a. Coordination Drawings
    b. System Labeling
    c. Red Line Drawings and Documents

3. Post Construction:

    a. Test Plan and Procedures, also Testing sign off sheets.
    b. Field Quality Control Reports/Test Results
    c. Fiber Optic and UTP cabling test results.
    d. Record (as-built) Drawings
    e. Spare Parts List
    f. Manuals
    g. Maintenance Support
    h. Warranties

C. Quality Assurance (QA) Plan: submit a QA plan and reporting program containing a project schedule with anticipated milestone data for all project related tasks (i.e., shop drawing submittal, various construction milestones, testing, acceptance, etc.).

D. Qualifications and Certificates

1. Installer Qualifications:

    a. Qualification Data: The work specified herein shall be performed by a qualified installer, as defined, and described herein.
    b. Installer shall be certified by the equipment vendor, for installation of the specific manufacturers and systems provided.

2. Seismic Qualification Certificates: For equipment frames from manufacturer.

    a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
    c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Materials and Equipment List:

1. Complete list of all materials, equipment and accessories proposed for this Work. This list shall include manufacturers, complete catalog identification numbers and model or system designator, quantities, options, product data as described below, basic system architectural block diagrams, and CPU software operating features.
2. The submittal shall be in enough detail so that the equipment and materials proposed can be readily identified.
3. Submittal of partial lists is not acceptable.

F. Product Data:

1. For each type of product indicated.
2. It will be ordered by specifications section.

    a. Each product data sheet shall reference the appropriate section and subsection.

3. Collect Product Data into a single submittal for each element of construction or system.

a. Include:

1) construction details,
2) material descriptions,
3) dimensions of individual components and profiles,
4) standard colors and finishes,
5) rated abilities,
6) operating characteristics,
7) electrical characteristics,
8) furnished specialties,
9) accessories, Is shall also include.
10) roughing-in diagrams and templates,
11) standard wiring diagrams, controls, and performance curves.

Where Product Data must be specially prepared or modified because standard printed data is not suitable for use, submit as "Shop Drawings."

4. Clearly mark each copy to identify pertinent products, models, and accessories. Show performance characteristics and capacities. Show dimensions and clearances required. Include the following information:

a. Reference to appropriate specification section and subsection.
b. Compliance with recognized trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.
g. Manufacturer's printed recommendations.

G. Samples: Along with project data and shop drawings, submit one (1) sample for each exposed security devices and security devices with color and finish options, for review by the Architect. The Owner's Representatives/Architect shall retain these devices as record of the approved equipment for the length of the project.

H. Shop Drawings:

1. The shop drawing submittals shall include highly detailed, to-scale, drawings describing the products (systems, equipment, devices and materials) and services as to precise locations, mounting details, wiring details and installation details for equipment, details and dimensions, conduit sizing, conduit routing, power and data riser diagrams, point-to-point interconnect diagrams, equipment schedules, zoning schedule, door schedules, VSS camera schedules, system interface schedules or diagrams, power requirement schedules, stand-by/emergency power schedule, cost reports, and such other diagrammatic or written descriptions which shall allow a thorough and accurate understanding of the security systems and equipment that are being furnished, how they are intended to function, how they will be installed, and all other necessary information of similar intent.
2. No work shall commence nor, shall any equipment be ordered until the submittals have been approved in writing. All work shall be in accordance with approved submittals. A detailed completion schedule shall be submitted with all submittals.
3. Indicate, among other requirements noted herein, the accurate locations of all conduit, raceway, junction and utility boxes, termination panels, power supplies, Access Control and Intrusion Detections panels, and all other equipment noted.
4. Clearly illustrate all mounting locations and methods, with detail for the installation of intrusion sensors, locking hardware, and request-to-exit devices at doors, glass break sensors and the mounting of interior and exterior VSS cameras. While some drawing

details may be "typical," the shop drawings shall illustrate the installation detail of each unique application.

5. Include plans, elevations, sections, details, and attachments to other work.
6. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
7. Equipment schedules and details shall provide the following information, as appropriate in each case:
   a. door number;
   b. door type;
   c. door position switch;
   d. request-to-exit type;
   e. request-to-exit location;
   f. auxiliary request-to-exit device,
   g. if any; lock type;
   h. power requirements; emergency power;
   i. access control type;
   j. special installation requirements;
   k. timed-shunt times; shunt type;
   l. precise, to-scale mounting location; zone or point designation;
   m. remote control of lock by specific and designated control console;
   n. VSS camera number activated by sensor or switch closure;
   o. input/output programming schedules;
   p. CPU output report's structure.
8. Camera schedules and details shall provide the following information:
   a. camera number;
   b. camera type;
   c. monitor number for each camera (if any);
   d. sequencing (if any);
   e. camera model number;
   f. camera features, such as auto-iris;
   g. lens specification;
   h. power requirements;
   i. type of power input;
   j. cable type;
   k. length of cable run;
   l. camera mounts;
   m. camera housing;
   n. camera housing features, such as heater, etc.;
   o. camera drives;
   p. cameras displayed on each monitor,
   q. especially linked displays;
   r. NVR positions;
   s. alarm queuing;
   t. special installation or carpentry requirements;
   u. camera and/or lens controls;
   v. alarm homing;
   w. termination method;
   x. lightning,
   y. ground loop, etc. protection.

9. Clearly illustrate the fields of view of each camera, as well as "park" positions for panning and zooming cameras (if any). If the camera is capable of wide-angle and telephoto viewing, both fields of view shall be indicated. The installer's "aiming point" shall be indicated.
10. The submittal shall clearly identify outdoor cameras mounting details and maintenance access concepts and design.
11. System interface schedules or diagrams shall clearly identify:
    a. sensors and switches which queue cameras, as well as the number of camera activated;
    b. DVR activation logic;
    c. VSS monitor switching logic;
    d. interfaces, if any, between the access control system;
    e. distributed processing capabilities and functions;
    f. sensors and switches exclusively used as request-to-exit devices.
12. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
13. Exposed equipment: Submit one (1) sample for each exposed security devices and security devices with color and finish options, for review by the Engineer and Architect. The Engineer/Architect shall retain these devices as record of the approved equipment for the length of the project.
14. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

I. System labeling: submit labeling scheme and samples.

J. All post construction submittals must be presented and approved prior to final acceptance.

K. Formal Test Plan and Procedures: 30 days prior to acceptance testing and final inspection, submit a formal test plan and test procedures.

L. Spare Parts and Components List: At the conclusion of the work, submit a complete list of manufacturers recommended spare parts and components required in order to satisfactorily maintain and service the systems for a minimum of two years.

M. Manuals:

1. Prior to final acceptance, complete sets of Operation, Maintenance and Service Manuals shall be submitted for systems and equipment provided under this contract.
2. The manuals shall be compiled, assembled, and indexed, in an easily identifiable hard cover form. Three (3) sets of the manuals shall be submitted prior to final acceptance testing.
3. The manuals shall include the following:
    a. Complete operating instructions.
    b. Complete maintenance instructions, wiring diagrams, troubleshooting instructions.
    c. System service instructions for work which manufacturers recommend user service.
    d. Complete parts list for each major item of equipment and/or for each system.
    e. Complete collection of manufacturers' product and catalog literature for equipment and systems installed under this contract.
    f. Manufacturers' warranties.
    g. Operating characteristics, performance data, ratings, and manufacturers' specifications for each item of equipment or system.
    h. Where practical, internal wiring diagrams and schematics.
    i. Name, address, and telephone number for service for each item of equipment or system.

j. Software User Documentation: Manual include operating instructions, programming instructions, technical documentation, and maintenance procedures to permit making changes to system configuration.

N. Record Drawings and Specifications

1. Produce and keep up to date a complete record-built set of prints (black-line bonds) which shall be corrected and marked up to show every change from the original Specifications and Contract Drawings through final acceptance. This set of drawings shall be protected against soiling, tears, and similar damage and defacement. This set shall be kept on the job site and shall be used only as a record set. (This shall not be construed as authorization to make changes in the Work without proper approvals.)
2. The as-built drawings will be kept up-to-date and will be checked monthly as a requirement for approval of monthly progress payments.
3. Upon completion of the work and before final payment, produce and submit a final set of record (As-Built) drawings by updating the AutoCAD files of the construction set of drawings (to be provided by the Owner) with the information from the as-built set. The submittal shall include the original record set of black-bonds and the electronic files of the as-built drawings in both AutoCAD format and PDF format.
4. At the conclusion of this project, two sets of black-line bond and two copies of the drawing files on Windows based media, formatted for use by Autocad 2015 (or later version), of all the security drawings specifically prepared for this Contract, shall be provided. The drawings shall be instrument drawn and shall contain all changes shown in the record set. Sepia line drawings on paper are not acceptable.

O. Service/Maintenance Support

1. Maintenance and repair of the system (parts and labor) shall be provided free of charge during the warranty period, including repair of workmanship defects. Free software upgrades during the warranty period.
2. Extended service/maintenance agreements for up to four (4) years after the warranty expires shall be available. It should be renewable monthly, quarterly, or yearly. Provide pricing for a one-year maintenance and service agreement, with options for two (2) three (3) and four (4) years, for all equipment furnished under this scope. This pricing shall be listed separately as a Pricing Alternate.

P. Warranties

1. All components, parts and assemblies supplied as part of this scope of work shall be warranted against defects in material and workmanship for a period of at least twelve (12) months (parts and labor), commencing upon the date of acceptance by Owner. A qualified factory-trained service representative shall provide warranty service.
2. As a condition precedent to the final payment, execute a written guarantee (warranty) to the Owner certifying that all the contract requirements have been completed in accordance to the final Specifications and Contract Drawings and warranting all materials and equipment furnished by him under this contract to remain in satisfactory operating condition (ordinary wear and tear, abuse and causes beyond his control for this Work excepted) for a period of one (1) year from the date of final acceptance or beneficial use, whichever is later.
3. All defects or damages due to faulty materials or workmanship shall be repaired or replaced without delay to the Owner's satisfaction at no cost to the Owner.
4. Provide four (4) periodic inspections at no cost to the Owner during the warranty period.
5. When equipment and labor covered by the installer's warranty or by a manufacturer's warranty have been replaced or restored because of his failure during the period of that

warranty, the warranty period for the replaced or repaired equipment or restored work shall be reinstated for a period equal to the original warranty period and commencing with the date of completion of the replacement or restoration work. If any manufacturer customarily provides a warranty period greater than one (1) year, the Security Contractor's warranty shall be for a greater period.

6. In no case shall the integrated system/security equipment warranties be voided where user-programmable programming changes are performed by the trained Owner's appointed system programming representative, to include redefining system input/output points, operation characteristics, time delays, and report formats to the Owner's site-particular requirements.

Q. Definition of Acceptance

1. The Owner acceptance of the installation will be based upon satisfactory performance during a thirty (30) day period of beneficial use beginning after all the other acceptance requirements listed below have been satisfied in full by the Owner.
2. Acceptance of the installation will be reasonably and good faith determined by the Owner or its agents. Partial use of the installation prior to completion will not be considered as contributing in part or in whole to the thirty-day period. Problems discovered during the thirty (30) day period covered under the responsibilities of the Vendor must be fixed at no cost to the Owner.
3. Acceptance will not be given, and no final payments will be made, until all problems have been fixed to the Owners' full satisfaction. Acceptance does not absolve the installer from any of its obligations under warranties and guarantees. The other acceptance criteria are the following:
4. All tests have been passed and all required test results have been submitted in appropriate format and have been accepted without dispute by the Owner.
5. All required documentation has been submitted.
6. All required labeling has been completed.
7. All work has been completed as required by the specifications, including all cable runs and pathways in their permanent places, and all cabinets, racks, and cable pathways (i.e., ladder, tray, etc.) secured.
8. All Punch List items have been completed.
9. All warranties for the installation have been obtained by installer.
10. The Security Contractor has submitted written notification that the installation is completed and that all specification requirements have been met.
11. Upon satisfactory completion of acceptance requirements by the Security Contractor, and after satisfactory performance during the thirty (30) day period, and correction of any defects found, the Owner will notify the Security Contractor in writing of his acceptance of the installation.

1.6 SUBSTITUTIONS, DEVIATIONS AND CHANGES

A. Substitutions

1. Requests for substitution are permitted for materials specified with an "or approved equivalent" clause or other language of same effect in the Contract Documents. No request for substitution will be entertained if this clause has not been specified.
2. Submit requests for substitutions (as well as relevant technical data pertaining to substituted equipment) to the specifier ten (10) days prior to the close of bid for evaluation and approval.
3. Substitutions may be permitted if the requirements of the proposed substitution comply with the general requirements and product specifications of the Contract Documents.

B. Deviations

1. Any deviations or changes involving extra work are not permissible without prior review and written approval by the Owner or his duly authorized representative.

C. Changes

1. All work described in Contract Riders shall follow the methods, requirements and general arrangement of this Specification unless otherwise noted.
2. All pricing and proposals for changes shall be submitted detailing all items and related costs in accordance with the provisions of the Contract for changed work.
3. The Security Contractor may be required to provide enough manpower to install systems and cabling not specified herein. The Security Contractor, if required, shall provide this work at the labor rates specified, without negative impact on the project schedule.

1.7 TRAINING

A. Upon completion of the installation, the Security Contractor will provide on-site training in the complete operations of the system.

B. Engage factory-authorized service representatives to train Owner's maintenance personnel to adjust, operate, and maintain security access systems.

C. The following establishes basic and minimum training requirements: Provide technical services and materials to instruct operators, maintenance persons, and programmers/database set-up personnel to operate, maintain and program the system.

D. Provide minimum one (8) hours onsite training for the video surveillance, one (8) hours of onsite training access control system, one (4) hours onsite training for the shooter system, one (8) hours onsite training for the Intercom and Emergency Notification System which shall include training in the proper installation and programming of all related hardware and software and include training of the department end-user.

E. Training of console operators & maintenance personnel:

1. Train up to (12) operators, administrators, and maintenance personnel. The instruction shall be provided by a competent factory trained engineer or professional instructor (that has completed manufacturer's training) representing the Security Contractor. Self-study or self-paced courses are not acceptable.
2. Provide each operator with complete, printed operating instructions and a brief sub system description in manual or handbook form. Training manuals shall be delivered for each trainee with two additional copies delivered for archiving at the project site. The manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson.
3. The operators shall be trained in preventative maintenance of equipment.
4. Certification of successful operators shall be provided upon the completion of training. Certification shall consist of correspondence drafted on the Security Contractor's Company Letterhead stating that Owner's staff has been trained in accordance with the contract documents and manufacturers standards and are fully proficient in the operation of the newly installed Security System.

F. Where the Security Contractor presents portions of the course by audio-visual material, copies of the audio-visual material shall be delivered to the Owner either as a part of the printed training manuals or on the same media as that used during the training sessions.

G. A training day is defined as (8) hours of classroom instruction, including two 15-minute breaks, and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the

training facility. For guidance in planning the required instruction, the Security Contractor should assume that attendees will have a high school education or equivalent and are familiar with the facility. Approval of the planned training schedule shall be obtained from the Owner at least (10) days prior to the training.

1.8 QUALITY ASSURANCE

A. Unless otherwise specifically noted, all equipment, material, and articles to be installed shall be new, best of their respective kinds, free from defects, listed by Underwriter's Laboratories for the intended use, bearing their label and of the most suitable grade for the purpose intended.

B. Non-compliant products installed as a part of this Contract shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Security Contractor.

C. Unless otherwise specifically noted, reference to any equipment, material, article, or patented process, by trade name, make or catalog number shall be regarded as establishing a standard of performance and quality. Provide the name of the manufacturer, the model number and other identifying data and information respecting the performance, capacity, nature, and rating of the electrical, mechanical, and other equipment that the Security Contractor contemplates incorporating in the work.

D. When so directed, samples shall be submitted for approval at no cost to the Owner. Equipment, material, and articles procured, installed, or used without required approval shall be at the risk of subsequent rejection. Warranties for all installed products shall be in accordance with the Contract General Provisions and as cited herein.

E. The services of a qualified manufacturer's technical representative, thoroughly experienced in the installation and operation of the type of system being provided, shall be obtained by the Security Contractor, at no cost to the Owner, to consult on equipment selection, installation, and testing of the specified systems if and as requested by the Owner or its authorized representatives.

F. 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. Grounding: Comply with ANSI-J-STD-607-A.

H. Modularity: Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. System components shall be designed to facilitate modular subassembly and part replacement.

I. Reliability: Provide only new, unused components free from flaws or imperfections, which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five thousand (5000) hours. Provide components designed for continuous operation. Electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL seven-hundred-ninety-six (UL-796). Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. Power-dissipating components shall incorporate safety margins of not less than twenty-five (25) percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Light duty relays and similar switching devices shall be solid-state or hermetically sealed electro-mechanical type.

J. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged and assembled that

they are readily accessible to maintenance personnel without compromising the defeat resistance of the various ESS subsystems.

K. Availability: Provide products and services available within the project schedule established for this scope of work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of the Construction Indoor Air Quality Management Plan and the Construction Waste Management Plan.

B. Deliver materials in original packaging, bearing brand name and identification of manufacturer or supplier.

C. Store materials to keep them dry and protected from soiling, dirt, or damage. Neatly stack gypsum boards flat to prevent sagging.

D. Handle gypsum boards to prevent damage to edges, ends, or surfaces. Protect trim accessories from being bent or damaged.

1.10 PROJECT CONDITIONS

A. Waste Management: Comply with the requirements of the Construction Waste Management Plan.

B. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.11 COORDINATION

The security contractor shall perform the following:

A. Coordinate with the base building security (if required) to ensure that the same access card can be used to access the building lobby turnstiles, lobby access doors and elevator cars.

B. Coordinate schedule, site access and other administrative and general items with the General Contractor.

C. Coordinate layout and installation of security equipment in the telecommunications rooms, copper and/or fiber backbone and LAN requirements with the Owner.

D. Coordinate with the General Contractor (GC), Telecommunications and Electrical contractors for the Conduit, Power and Fiber Optic cabling needed for the exterior camera and the Emergency Call Stations (ECS).

E. Meet jointly with Owner to exchange information and agree on details of equipment arrangements and installation interfaces.

F. Record agreements reached in meetings and distribute them to other participants.

G. Coordinate location of power conduit, junction boxes and receptacles with locations of security equipment requiring electrical power to operate.

H. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.
4. So, connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

I. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

J. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

K. Coordinate sleeve selection and application with selection and application of firestopping specified in the Electrical Section.

L. Coordinate routing of the security cables with the other trades.

M. Coordinate with electrical installation of the fire alarm system relays at each lock ACP location.

N. Coordinate the installation of the door/frame security package with the Division 8 Door Hardware Contractor. Security door hardware includes any electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, Balanced Magnetic Switches, lock power supplies, termination cabinets, and final connection of wiring to door security devices; the connections will be to the appropriate screw terminals on the screw-type termination strips located in the termination box. Responsibility for furnishing and installing a typical Door/Frame Security Package is divided as follows:

1. Door Hardware Contractor responsibilities:
    a. Shall furnish and install factory-prepared door frame fitted with factory-prepared cut-outs and appropriate pre-welded outlet boxes to accept the door security devices.
    b. Shall furnish and install all non-security mechanical hardware. This shall include but not limited to mechanical hardware, hinges, door closers, door stops, etc.
    c. Shall furnish all electronic locksets, power transfer hinges, and Door Contacts, for the new doors.
    d. Shall install all Electromagnetic Locks, Shear Locks, and Electronic Strikes for the doors.
2. Security Contractor responsibilities:
    a. We shall install all Balanced Magnetic Switches, Door Contacts, electronic locksets and Power Transfer Hinges, provided by the door hardware supplier, as specified on the drawings.
    b. Shall furnish and install termination cabinet furnished with screw-type termination block(s). The termination block(s) shall include additional screw terminals to accept the wiring interconnect inputs from the Card Reader(s), Request-to-Exit passive infrared detectors and/or the Request-to-Exit push button switch, as required, which are not part of the door/frame security hardware package.
    c. Shall coordinate with the Electrical Contractor who will be providing all hi-voltage power to security equipment as required, including but not limited to, the types and sizes of interconnecting wiring, outlet box sizes, electrical contacts needed and screw terminal sizes.
    d. Shall coordinate with the Electrical Contractor who will be providing Fire Alarm relays for interfacing with the ACP's.
    e. We shall coordinate with the Elevator Vendor who will be providing elevator cars, controllers and traveling cables.

f. Shall coordinate with Telecommunications Contractor who will be providing data connections for the cameras, control panels, servers, workstations, and any other security equipment that requires data or telephone connectivity.
g. Shall coordinate with the Telecommunications Contractor who will be providing the Local Area Network (LAN) switches and wireless access points (WAPs).
h. Shall coordinate with the building Security for access control cards, elevator interface and Visitor Management System.

3. Electrical Contractor responsibilities:

a. Shall furnish, install and finally connect all security cabling and door, conduits, termination cabinet and/or junction box to all security devices, and devices associated with a door/frame, security door location.
b. Shall furnish and install all other security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, and other associated mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING FOR SECURITY SYSTEMS

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.2 PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

A. Hangers and Supports.

1. Cable Support: NRTL labeled.
2. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
3. Cable hangers and non-continuous supports shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
4. Shall have various attachment options for: wall, ceiling, joist, beam, flange, raised floor pedestal and others type of mounting.
5. Support brackets with cable tie slots for fastening cable ties to brackets.
6. Lacing bars, spools, J-hooks, D-rings, straps, and other devices.
7. Cable straps (ties) shall be reusable Velcro-style with hook and loop or d-ring, available in various colors and sizes. Plenum rated straps shall be used in plenum spaces.

B. Conduits and Back Boxes:

1. The security contractor, where needed, will install security and camera cabling in conduit of the correct size. The security contractor will size the conduit for a 40% fill.
2. The conduit will be provided where indicated on drawings or as required.
3. Provide conduit and boxes as shown on the communications drawings.
4. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
5. Flexible metal conduit shall not be used unless specifically noted.

C. Sleeves

1. Refer to Division 26 "Electrical".

D. Sleeve Seals and Firestopping

1. Install to seal exterior wall penetrations.
2. Use 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 them 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. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

E. Grout

1. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.3 LIGHTING AND SURGE PROTECTION

A. Intrusion detection, access monitoring and control, video circuitry, and communication circuits that connect to outdoor mounted equipment shall be protected at both ends against excessive voltages.

B. This requirement shall apply for circuits that are routed both in underground conduits and overhead runs. As a minimum, both primary detection devices, such as three (3) electrode gas-type surge arrestor, and secondary protectors shall be installed to reduce dangerous voltages to levels that will cause no damage. Fuses shall not be permitted as lightning and power surge protection devices.

C. Provide fail-safe gas tube type surge arrestors on all exposed security data circuits. Breakdown voltage for the unit shall be three hundred to five hundred (300-500) VDC. The unit shall have equal performance for bi-polar operation with an automatic reset feature, and a minimum life of one thousand (1000) surges with ten (10) times one thousand (1000) microsecond waveform at one thousand (1000) amperes.

2.4 VIBRATION AND SEISMIC CONTROLS FOR ESS

A. Security systems components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. The term "withstand" means "the unit will remain in place without separation from any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

C. Equipment shall be seismically rated and braced according to IBC 1621.

2.5 IDENTIFICATION FOR SECURITY ESS

A. Comply with requirements of Division 26 Section "Identification for Electrical Systems".

B. The identification for the communications systems shall meet all the requirements of a Class 3 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

C. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

D. Identify all the components of the security systems.

E. For fire-resistant plywood, do not paint over manufacturer's label.

F. All labels shall be preprinted or computer-printed type.

G. Type, format, wording, printing, and placement of labels shall be coordinated with Owner's existing administration plan.

H. Labeling System

1. PC-based software, WINDOWS compatible, capable of supporting alpha numeric characters and Windows True Type Fonts.
2. Compatible with laser printers.
3. Label sizes supported:
4. Minimum: 0.8" W x 0.2" H.
5. Maximum: 3.0" W x 12.0" H.

2.6 EQUIPMENT ENCLOSURES FOR ESS

A. Cabinets or housings, power supply enclosures, terminal cabinets, multiplexer, data gathering panels, wiring gutters, and other component housings, collectively referred to as enclosures, shall be so formed and assembled as to be sturdy and rigid.

B. All Interior Enclosures shall be NEMA 3R and all Exterior Enclosures shall be NEMA 4 rated, any enclosures that have security equipment and/or wire splices or connections inside shall have a tamper installed which shall be connected to the ACAMS system.

C. Thickness of metal in cast and sheet metal enclosures of all types shall not be less than those in Tables I and II, UL six-hundred-eleven (UL-611). Sheet steel used in fabrication of enclosures shall be not less than fourteen (14) gauge. Doors and covers shall be flanged. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type, or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less that twenty-four (24) inches shall be provided with a single lock. Where the latch edge of a hinged door is twenty-four (24) inches or more in length, the door shall be provided with a three (3)-point latching device with lock; or alternatively with two (2) locks, one (1) located near each end.

D. Any ventilator openings in enclosures and cabinets shall conform to the requirements of UL six-hundred-eleven (UL-611).

E. Unless otherwise indicated, sheet metal enclosures, excluding control console enclosures, shall be designed for wall mounting with top holes slotted. Mounting holes shall be in positions which remain accessible when all major operating components are in place and the door is open but shall be inaccessible when the door is closed. Covers of pull and junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the security system.

F. All enclosures, cabinets, housings, boxes, raceways, and fittings of every description having hinged doors or removable cover plates which contain circuits of the security system and its power supplies, shall be provided with cover-operated corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door is moved as little as one quarter (1/4) inch from its normally closed position.

2.7 EXPOSED COMPONENTS

A. Components exposed and accessible to the public shall be of a design and construction typical and suitable for such use. All device fasteners shall be an approved security type. All components and materials shall be resistant to vandalism and waterproof.

B. Colors and finishes and mounting details of all exposed components shall be approved by Architect via submittals.

2.8 ELECTRONIC COMPONENTS FOR ESS

A. All electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL seven-hundred-ninety-six (UL 796). Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. All power dissipating components shall incorporate safety margins of not less than twenty-five (25) percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. All electronic printed circuit boards furnished and installed shall be provided with a mildew/fungus-resistant and moisture inhibiting coating.

2.9 CABLES FOR ESS

A. All cables installed in plenum spaces shall be plenum rated.

B. PVC-Jacketed, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

1. NFPA 70, Type CM.
2. Flame Resistance: UL 1581 Vertical Tray.
3. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; plastic jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
4. NFPA 70, Type CMP.
5. Flame Resistance: NFPA 262 Flame Test.

C. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG. RS-485 communications require 2 twisted pairs, with a distance limitation of 4000 feet.

1. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 Flame Test.

D. Multi-conductor, PVC Readers and Wiegand Keypads Cables: No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.

1. NFPA 70, Type CMG.
2. Flame Resistance: UL 1581 Vertical Tray.
3. For TIA/EIA-RS-232 applications.

E. Paired PVC Readers and Wiegand Keypads Cables: Paired, 3 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.

1. NFPA 70, Type CM.
2. Flame Resistance: UL 1581 Vertical Tray.

F. Paired PVC Readers and Wiegand Keypads Cable: Paired, 3 pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.

1. NFPA 70, Type CM.
2. Flame Resistance: UL 1581 Vertical Tray.

G. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum foil-poly-polypropylene tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

H. Plenum-Type, Multiconductor, Readers and Wiegand Keypads Cable: 6 conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

I. Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.

1. NFPA 70, Type CMG.
2. Flame Resistance: UL 1581 Vertical Tray.

J. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

K. Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.

1. NFPA 70, Type CMG.
2. Flame Resistance: UL 1581 Vertical Tray.

L. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

M. Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum foil-polyester tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.

1. NFPA 70, Type CMR.
2. Flame Resistance: UL 1666 Riser Flame Test.

N. Plenum-Type, Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum foil-polyester tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

O. Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.

1. NFPA 70, Type CMG.

P. Plenum-Type, Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.

1. NFPA 70, Type CMP.
2. Flame Resistance: NFPA 262 Flame Test.

Q. LAN Cabling: Comply with Division 28 Section "Conductors and Cables for Electronic Safety and Security."

1. NFPA 262.
2. CAT 6A

R. Composite Cable:

1. Element 1 (Lock Power): 18 AWG, 4 Conductor Non-Shielded Plenum
2. Element 2 (Card Reader): 22 AWG, 3 Pair Overall Shielded Plenum
3. Element 3 (Door Position Switch): 22 AWG, 2 Conductor Non-Shielded Plenum
4. Element 4 (Request to Exit Device): 18 AWG, 4 Conductor Non-Shielded Plenum

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR SECURITY SYSTEMS INSTALLATION

A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.

B. The Security Contractor shall comply with NECA 1.

C. The Security Contractor shall measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange, and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications' equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Right of Way: Give to piping systems installed at a required slope.

G. The Security Contractor shall bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

H. The Security Contractor shall coordinate location of power raceways and receptacles with the locations of security equipment requiring electrical power to operate.

I. The Security Contractor shall clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

J. The Security Contractor shall thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely, paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishing is applied. Restore all surfaces to their original condition.

K. All wall-mounted equipment shall be mounted square and plumb.

L. The Security Contractor shall complete work according to the agreed upon schedule. Cooperate in coordinating your activities with other planned and ongoing work at the site in a manner that facilitates meeting the schedule. This includes coordination with the various trades in determining work schedules and in resolving physical installation issues.

M. All materials, cables, components, and all aspects of the installation must meet all local, state, and federal laws, as well as applicable code and regulatory requirements. They must also meet the requirements of any other entity legally empowered to set standards or codes governing composition and use in this installation, as well as any rules specific to the site. Code and regulatory requirements must prevail if there are any conflicts with requirements stated or implied in this specification and its companion documents. Where there is uncertainty in determining precedence, or what specific code or regulatory requirements apply, an Authority Having Jurisdiction (AHJ) over the issue in question will decide.

N. The Owner reserves the right to require the Security Contractor to remove from the project any employee that deems careless, problematic, or is identified by competent authority as not conforming to required safety codes, regulations, or standards, or is cited for performing or acting in an objectionable manner, thus affecting the safety or productivity of others.

O. The Security Contractor shall take all necessary safety and health precautions and warnings required by codes and regulations to protect the project, its workers, the public, and the property of others. Applicable OSHA regulations or AHJ directives must be followed.

P. The Security Contractor shall accept responsibility for all damages to persons or property that occurs as a result of its fault or negligence.

Q. The Security Contractor shall designate a Project Manager to act as the technical and managerial interface with the Client and or its representatives.

R. The Security Contractor shall participate in meetings covering technical, installation, and coordination and management issues.

S. The Security Contractor shall perform all work required under this specification in a skillful and professional manner in accordance with standards and practices documented and/or accepted by industry, such as the ANSI/TIA/EIA, NECA standards and codes.

T. The Security Contractor's technicians must be certified on the proper assembly and installation of all components they are working with and must follow manufacturer's specific installation requirements.

U. The Security Contractor shall maintain its installation and storage areas free from an accumulation of waste material and rubbish and dispose of them in a manner acceptable to the Client, building management and the General Contractor/Construction Manager.

V. The Security Contractor shall provide all tools needed to perform its required work. Upon completion of the project, all tools, equipment, and materials not designated as belonging to the

Client must be removed. After completion, the work areas must be left in a clean and unobstructed condition.

W. Security Contractor shall be responsible for the security of all its installation materials, whether purchased by, or supplied to the Security Contractor, as well as tools and ancillary components and documents.

X. The Security Contractor shall order all components in a timely manner so that installation dates are not compromised. Materials must either be on hand, or available on short notice, so that the installation may be expedited if required, or if the opportunity to do so presents itself.

Y. The Security Contractor shall obtain all necessary permits.

Z. The Security Contractor shall ensure that any excess materials are ordered for the project they are kept in their original condition and packaging for restocking.

AA. The Security Contractor shall where required by local code, trade harmony shall be observed by using only approved union-based installation workforce.

3.2 ENCLOSURES FOR ESS

A. All enclosures shall have tamper provisions connected to the ACAMS system.

B. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened and removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall not be greater than one (1) second.

C. Enclosure and tamper switch shall function in such a manner as to not allow direct line of sight to any internal components or the tampering of the switch or circuit wiring. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware concealed so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door protected; and shall be wired so that they break the circuit when the door is disturbed.

D. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pull set, automatic-reset type. Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches**.**

3.3 ALARM ANNUNCIATION

A. Alarm announcement shall include intrusion detection, tamper, fail safe, line fault, and power loss.

B. Intrusion Detection: Intrusion detection alarms shall include the full range of interior point protection sensors, volumetric space, access control protection sensors, and duress alarms. Duress alarms shall be annunciated to clearly distinguish them from other intrusion detection alarms.

C. Emergency/Duress Pull Cord and Defibrillator Enclosure: Duress and defibrillator alarms shall be annunciated to clearly distinguish them from other intrusion detection alarms.

D. Tamper: Enclosures, cabinets, housings, boxes, raceways, and fittings having hinged doors or removable covers, and which contain circuits for the security system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved as little as one quarter (1/4) inch from the normally closed position.

1. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed.
2. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be one (1) second or less.
3. Enclosure and tamper switch shall prevent direct line of sight to any internal components and prevent switch or circuit tampering.
4. Tamper switches shall be inaccessible until the switch is activated; conceal mounting hardware so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door or cover protected; and shall be wired to break the circuit when the door or cover is disturbed.
5. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pull set, automatic reset type. Tamper alarms shall be annunciated to be clearly distinguishable from intrusion detection alarms.

E. Fail-Safe Alarms

1. Provide a fail-safe capability in all critical elements of the system.
2. Fail-safe is defined as the capability to monitor for proper system functions and to report an alarm when a failure is detected in any critical system function.
3. This shall include, but not be limited to, the ability to monitor communication link integrity and to provide self-test.
4. When diminished functional capabilities are detected, shall the system provide announcement of the fault?
5. Fail-safe alarms shall be annunciated to clearly distinguish them from other types of alarms.

F. Fail-Safe Locking

1. All locking shall be fail-safe to the extent that such locking is permitted by appropriate and pertinent life-safety and building codes.
2. Fail-safe locking shall be understood to mean that upon failure, locks shall fail in the "unlocked" and "unsecured" position All locking shall be interconnected into the building's fire alarm system and, upon activation of the fire alarm system, shall immediately "unlock" to permit emergency egress from the building.
3. The Security Contractor shall coordinate all interface requirements with the fire alarm system installer.
4. The Security Contractor shall furnish and install the necessary interface relays and interconnecting wiring, conduits, and mounting hardware, etc. to affect this operation.

G. Fail-Secure Locking: Where required for Locking devices in the Facilities, Locking Devices shall be Fail-Secure to the extent that such locking is permitted by appropriate and pertinent life-safety and building codes. Fail-Secure locking shall be understood to mean that upon failure, locks shall fail in the "locked" and "secured" position.

H. Line Fault: As a minimum, fault isolation at the systems level shall have the same geographic resolution as provided for intrusion detection. The communication links of the security system shall have an active mode for line fault detection. Active mode is defined as that in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected. The system shall be either a static system or a dynamic system. In a static system, the "no-alarm" condition shall always be represented by the same signal, which shall

be different than the signal originally transmitted. The dynamic system shall represent "no-alarm" with a signal which continually changes with time.

I. Power Loss: Provide the capability to detect when any critical component of the system experiences loss of primary power and/or is switched over to either emergency power or uninterruptible power and to declare an alarm. The alarm shall clearly annunciate the identity of the component experiencing the power loss.

3.4 GROUNDING AND BONDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

C. All cabling used to bond grounds are to be tagged with labels with the point of origin i.e., going to/coming from, with printed labels.

3.5 PATHWAYS INSTALLATION FOR SECURITY SYSTEMS

The Security Contractor shall ensure the following:

A. Comply with NECA 1.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. All conduits for the security and video cabling required shall be in electrical metallic tubing (EMT). Minimum size of conduit shall be one (1) inch. Connections shall be threadless type fittings or couplings. Fastenings and supports for conduit shall be in accordance with the national and local codes.

D. The Security and Telecommunication Contractors shall submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Owner or Owners Representative prior to the initiation of Work. Shop drawings of the security systems conduit routing shall be coordinated by the Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Care shall be taken to ensure that access to other building components (e.g., air conditioning ducts) is not restricted by cable pathways.

G. Cable management and support hardware must be UL listed for use in the environments in which they will be employed.

H. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.

I. Secure conduits to backboard when entering room from overhead.

J. Extend conduits 3 inches above finished floor.

K. Provide metal conduits with grounding bushings and connect with grounding conductor to grounding system.

L. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

M. Pathways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings.

N. All conduits shall be affixed or supported at intervals and using prescribed methods and devices in accordance with governing codes. No run of conduit between outlets or fittings shall contain more than two quarter bends (180 degrees). Bends shall be made such that the conduit will not be damaged, and that the interval diameter will be effectively reduced.

O. All conduit connections shall be tight so as not to create intermittent loss of ground protection. All cut ends entering fittings shall be reamed smooth or have a bushing inserted to prevent damage to wire insulation.

P. Conduit, raceways, and other pathways shall be kept at least six inches from uninsulated flues, steam pipes or any pipe containing a hot gas or liquid. As far as practical, avoid traps and dips in conduit runs, which might collect moisture.

Q. Strict attention shall be given to all conduits containing fiber optic cabling to ensure that manufacturer's recommended conduit bend radii limitations/restrictions are followed.

R. Where conduits connect to sheet steel enclosures, they shall be fastened with two (2) locknuts where insulating bushings are used. Bushings shall be installed on ends of all conduits where they terminate in pull boxes, outlet boxes, cabinets, etc. and shall be of the insulating type and shall be securely fastened with locknuts on each side. Crushed or deformed conduits shall not be installed. Bushings shall not be used as locknuts. Open ends shall be sealed around security conductors to be liquid tight using an approved air-drying sealer after capping ends with insulated bushings.

S. Conduits crossing expansion joints in concrete slabs shall be provided with suitable expansion fittings, or other suitable means, to compensate for building expansion and contraction. Conduits traversing hazardous areas shall use the penetrations and fittings shown on the drawings provided under other sections of the contract. Seal the fittings subsequent to verifying the integrity of the contained conductors.

T. Pathways shall not block ceiling or equipment access doors. Where conduit or raceway is passed through walls, floors, ceilings or roofs, annular space shall be sealed or patched. Openings in firewalls and all corridor walls shall be sealed with mineral wool or an approved silicone sealant.

U. No pathways shall be fastened to other pipe or conduit or installed to prevent the ready removal of other pipe or conduit for repairs.

V. Conduit, panels, devices, and boxes shall be secured by means of shields in concrete, machine screws on metal surfaces and wood screws on wood construction material. Threaded studs driven in my power charge and provided with either lock-washers and nuts or nail type nylon anchors are not acceptable in lieu of machine screws. Wood plugs shall not be used as expansion shields. Unless conditions or Drawings dictate otherwise, panels shall be located between 3'-6" and 6'-0" above floor level.

3.6 SLEEVES INSTALLATION FOR SECURITY SYSTEMS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 50 mm above finished floor level.

F. Size pipe sleeves to provide 6.4-mm annular clear space between sleeve and pathway or cable, unless indicated otherwise.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

J. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 25-mm annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.7 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Specification Section "Penetration Firestopping."

B. Cable/wire runs, and conduit shall be installed in accordance with applicable electrical work standards, national and local codes as well as manufacturers' specifications of installed equipment.

3.8 CABLE/WIRES INSTALLATION

A. Cable/wire runs shall be installed in accordance with applicable electrical work standards, national and local codes as well as manufacturers' specifications of installed equipment.

B. All ESS conductors shall be separated from 120V primary power lines. ESS conductors shall not share any pathways in which primary power conductors are run. Junction and receptacle boxes carrying 120V, or higher voltage, shall not in any way be attached to or carry security systems conductors.

C. Conductors shall be copper and shall not have a diameter less than eighteen (18) AWG unless otherwise indicated. Exceptions will be made for vendor-provided leads and internal

equipment wiring. If required, modify equipment wiring fittings which will not accept eighteen (18) AWG minimum conductors. Other exceptions may be granted for use of smaller gauge conductors upon approval by the Owner's representatives.

D. Conductors interconnected to equipment subject to movement shall be stranded or shall be of a type manufactured specifically for such interconnections.

E. Wire fill, conductors, conductors, conductors, conductors, conductors, conductors, conductors, conductors, conductors, and conductors, and conductors, and conduit where required shall be sized in compliance with the National Electrical Code. The number of conductors required may vary based on the manufacturers of the selected equipment. In no event shall new conduit fill exceed 40%.

F. If ESS conductors must share conduit with other low voltage conductors, prior approval is required. All system conductors shall be run concealed wherever practical and shall be placed in conduit.

G. All conductors shall be run continuously between sensors, processors, junction boxes, terminal strips or panels, and other approved devices. Splices between such locations are not to be permitted. Necessary junctions shall be made using screw-type terminal blocks, or in accordance with manufacturer's requirements for equipment connections.

H. Line supervision requirements shall be observed for all security cabling and devices.

I. All conductors shall be color coded and tagged consistently. Coordination with the Owner's representatives regarding the exact wire coding and tagging is mandatory. Transposing or changing color coding of conductors shall not be permitted. Conductor identification shall be provided within each enclosure where a tap, splice or termination is made, and at the equipment terminal of each conductor. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking will not be accepted. Marking shall be an approved permanent type utilizing an approved method. Tagging devices shall be approved and shall be permanent, not subject to inadvertent separation. All conductors at control consoles shall be bundled, neatly fanned out, and tagged. Cables and wires shall be tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Tagging shall be such that several conductors may be disconnected and reconnected without the use of drawings.

J. If required by manufacturers' specifications, shielding requirements shall be observed.

K. Only approved compounds shall be used. Pull strengths shall not exceed standards established by the National Electrical Code.

L. Submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Engineer prior to the initiation of Work. Shop drawings of the security systems conduit routing shall be coordinated by Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.

3.9 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.10 CLEAN, SQUARE INSTALLATION

A. All equipment shall be clean and free of paint and other defacing materials. All installations shall be square and plumb. Take care that other trades do not deface equipment and do not move equipment out of square and plumb.

3.11 ELECTRICAL POWER

A. High Voltage Power:

1. The Electrical Contractor shall furnish and install wiring, conductors, conduit, and termination for the supply of power to security system components. Except for the interconnection into the door hardware furnished devices, it shall be the responsibility of the General Contractor to furnish and install all low-voltage conductors and the Security Contractor to make all final connections to their equipment. The Security Contractor shall provide the Electrical Contractor with complete information regarding high voltage power requirements.

B. Low Voltage Power:

1. Low voltage power shall be provided using two-winding isolation-type transformers and rectifier circuits and shall supply DC voltages, where and as required. Voltage levels shall be as rated for the various systems' operational requirements. All low voltage power supplies shall be fully regulated, float type, with battery back-up, capable of supporting the operation of all equipment for a minimum of four hours. Low voltage power supplies shall be required for lock power, camera power, advanced processor controller (ACP) power and sensor devices power. A separate dedicated power supply shall be provided for the electrified locks and shall be connected to the building fire alarm system through the ACM board in the ACP.

C. Batteries:

1. Provide backup power by dedicated batteries in remotely located system elements such as remote access control panel units. Batteries shall be sized to provide continuous stand-by operation for a minimum of four (4) hours without recharge or replacement.

3.12 TESTING

A. General: Verify that all requirements of this specification are met. Verification shall be through a combination of analyses, inspections, demonstrations, and tests, as described below.

B. Verification by Inspection: Verification by inspection includes examination of an item and the comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the cited paragraph. Inspection may require moving or partially disassembling the item to accomplish the verification. Inspection shall be made of all equipment installations, proper functioning of all locking hardware and lock controls, mounting and wiring of electrical and signal distribution cabinets and components, and mounting and placement of sensors, VSS cameras, etc. to ensure compliance to the specifications and that the overall installation is accomplished in a professional and workmanlike manner. The Owner's quality control representative(s) shall have full opportunity to witness the required Security Contractor inspections or to conduct his own inspections of the installation.

C. Verification by Test and Demonstration: Verify by formal demonstrations or tests that the requirements of this Specification have been met.

D. Test Verification Requirements: Paragraphs 1-3 below list specific requirements which shall be verified by formal demonstration/test. The Owner, or its authorized representatives, shall be

afforded a fourteen (14) day advance notice of all subsystem demonstrations/tests. The Owner's Representative reserve the right to witness any and/or all the tests described below.

1. Preliminary Tests: Following installation, individually test each sensor and other components and verify the proper functioning of each component within a subsystem. Each subsystem shall be similarly tested until all detection zones, alarm assessment components, alarm reporting and display, and access control functions have been verified. Any deficiency pertaining to these requirements shall be corrected by the Security Contractor prior to final functional and operational tests of the system. When subsystem verification is complete, the entire system shall be tested to assure that all elements are compatible and function properly as a complete system.
2. System Operation Test: Following completion of the preliminary tests and the security system and component formal demonstrations, the Security Contractor shall conduct a formal test, to be known as the "System Operation Test," in which all components and subsystems of the security system are demonstrated to operate together as an integrated system. This test shall be performed over a continuous seventy-two (72) hour period. A testing plan and test procedures for each portion of the test shall be prepared by the Security Contractor and submitted 45 days prior to the start of any testing for approval in accordance with this Specification. Approval of the test procedures must be obtained prior to notification of testing to Owner or its representative. The Security Contractor shall demonstrate that the security system components and subsystems meet specification requirements in the "as-installed" operating environment during the "System Operation Test." While no formal environmental testing is required, the Security Contractor shall measure and record temperature, humidity, and other environmental parameters, and shall include this data in the test report to document the environmental parameters and the environment conditions which were encountered during the "System Operation Test."
3. Tests Upon Completion of Work: Upon completion of the Work, the system shall be subjected to complete functional and operational tests. When all required corrections have been accomplished, the system shall be retested. The Owner or Owner's Representatives shall be notified in writing fourteen days in advance of the proposed final acceptance testing and inspection date. The advance notice shall include certification that the installation is complete and operable and has satisfactorily performed the final tests specified herein. The acceptance testing and final inspection will be accomplished in the company of the Owner's representatives. Prior to the test date, prepare and submit for approval a complete and detailed final acceptance test check off list ("punch list"). The list shall be a complete representation of all specified functions and conditions, including contingency, priority, and abnormal modes of operation. The arrangement of the list shall be such as to provide an orderly method of tabulating checks of system features, response, and operation. The tests shall be structured so that all sensors and controls are stimulated directly in their installed and finally adjusted positions and all audible and visual displays, signals, alarms, and other responses are observed and printed. At the time of final acceptance testing all required tests shall be repeated and all defects will be corrected until the system is found to be acceptable to the Owner's Representative. A log of all test activities and results shall be maintained by the Security Contractor. Typed copies of this log shall be submitted within seven days of the testing. Final tests shall include, but are not limited to the following:
    a. Test of all central CPU's, peripherals, and all panel control functions.
    b. Test all graphic control and annunciation panel functions and displays.
    c. Test electrical supervision of all input/output sensor and data communication bus circuits.

d. Test of all alarm initiating devices.
e. Test of remote battery and battery chargers.
f. Test of the UPS system including a battery discharge test.
g. Test of access control system to include tie-in to fire alarm system.
h. Complete operation tests under emergency power.
i. Test of fiber optics signal transmission system.
j. Test of each UTP cable and the printed test results
k. Visual inspection of all wiring;
l. Verification that all required submittals have been provided and have been accepted;
m. Demonstrate software and programming/reprogramming functions of all micro-processor systems.
n. Verification of systems response time.
o. Carefully plan and coordinate the final acceptance tests so that all tests can be satisfactorily completed during one continuous testing period. Provide all necessary instruments, labor and materials required for tests, the equipment manufacturer's technical representative, and qualified technicians in enough numbers to perform the tests within the time limits imposed by this Specification.
p. In the event that the Owner, or authorized representative(s) are required to witness a re-test at a later date because the Security Contractor is either not adequately prepared to conduct the acceptance tests or because the systems being tested are failing such tests, which shall be solely determined by the Owner's representatives witnessing the tests, the costs of witnessing additional tests (based on time and materials at the established rates of the Owner's representatives) shall be borne exclusively by the Security Contractor. In such an event, the Security Contractor shall directly compensate the Owner's representatives witnessing the tests; compensation shall be provided within thirty calendar days of such, and all, additional tests.
q. Although successful completion of the final acceptance test has been completed, the security system shall not be considered accepted until it is determined that the complete security system is continuously trouble-free and operational, in a manner satisfactory to the Owner, for at least a seven-day period following final acceptance testing. A printout of the system's activity log will be accepted as proof of compliance with this requirement. If the system fails this operational test, make the necessary adjustments and the seven-day period will restart from the beginning. If the system fails to complete this operational test for four (4) consecutive seven-day restarted test periods, the system shall be considered inoperable and unacceptable. Make all necessary repairs, adjustments, and/or replacements, at his cost. When all adjustments have been completed and after proper notice has been given, the complete acceptance test will be re-performed and witnessed from the beginning. The Security Contractor shall be liable for all expenses for witnessing the retest as specified above. Repeated unsatisfactory operation and chronic system failures shall be considered cause for the complete system removal and replacement by the Owner. In this event, the Security Contractor shall be liable for all expenses and damages incurred, including legal fees and court costs.

4. Reliability/Maintainability Data: Record hours of component, subsystem, and system operation, together with failure and repair data. This information shall be incorporated into the System Test Report to be submitted.

3.13 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Prior to completion of the work, provide field operating instructions with respect to operation functions and maintenance procedures for the equipment and systems installed. Prepare six (6) copies of maintenance and operating instruction manuals prior to application for final payment. Organize operating and maintenance data into suitable sets of manageable size.

B. All equipment provided under this Section of the Specifications shall be placed in operation and shall function continuously in an operation test for a period of one week, without shut down due to mechanical failure.

C. Prior to scheduling the project final inspection and after completion of the entire installation period, provide all work required to adjust all controls, and all maintenance to place the systems in operation to meet the requirements of this Section of the Specifications and Contract Documents.

D. Provide operating, service, maintenance instruction manuals containing replacement data for the equipment which will require operating, maintenance, or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the others are checked for completeness.

E. Enough advance notice shall be given to Owner's designated operating personnel for the specific instruction period. Upon completion of instruction, obtain from the representative(s) written verification that the above-mentioned instruction has been performed. Such verification shall be forwarded to the Owner.

F. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins performance charts, pump curves, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed and bound in a hard back three ring binder. Fly sheets shall be placed before instructions covering each section. The instruction sheets shall be in 8 1/2 inches by 11 inches with large sheets of drawings folded in neatly. Each manual shall have the following minimum contents:

1. Table of Contents
2. Maintenance
    a. Maintenance and Lubricating Instructions
    b. Replacement Charts
    c. Preventive Maintenance Recommendations
    d. Trouble-shooting Charts for Equipment Components
    e. Testing Instructions for each Typical Component
    f. System Draining and Filling Instructions
    g. Two typed sets of charts indicating equipment tag number, location of equipment, specific equipment service, greasing and lubricating requirements as recommended, lubricant type and intervals of lubrication.
    h. Two types of instructions for ordering spare parts. Each set shall include name, telephone number and address of where they may be obtained.
3. Manufacturer's Literature
    a. The equipment for which shop drawings have been submitted and approved.
    b. Wiring Diagrams
    c. Installation Drawings
    d. Manufacturer's Representative and Contract Information
    e. Guarantees

3.14 CLEANING AND ADJUSTING

A. Subsequent to installation, clean each system component of dust, dirt, grease, or oil incurred or accrued from other project activities, and prepare for system activation by manufacturer's recommended procedures for adjustment, alignment, or synchronization.

B. Each component shall be prepared in accordance with the appropriate provisions of the component's installation, operations, and maintenance manuals.

C. Any damage caused by the Security Contractor to parts of the building, its finish, or furnishings, shall be repaired by Security Contractor at no increase in Contract costs.

D. All items of equipment shall be thoroughly inspected, and any items dented, scratched, or otherwise damaged, in any manner, shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Owner's Representative for inspection and approval.

3.15 SPECIAL TOOLS

A. Provide any and all special tools recommended by the manufacturer of furnished items, noted as not being commonly available.

3.16 CERTIFICATES OF APPROVAL

A. Upon completion of the work, furnish to Owner's Representative in duplicate, certificates of inspection and/or approval from state and local inspection authorities having jurisdiction indicating the installed systems compliance to their requirements.

END OF SECTION 280500

SECTION 28 10 00
ELECTRONIC ACCESS CONTROL AND INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This section describes the components that shall comprise the Access Control and Intrusion Detection portions of the unified Access Control and Alarm Monitoring System (ACAMS), and the practices to be used when installing these components. All information herein is intended to present minimum standards of performance, quality, and construction.

B. The systems shall include any signage, communications devices, access control panels, intrusion detection panels, I/O boards, card readers, request-to-exit devices, intrusion detection sensors, power supplies, and any conduit, raceways, wiring, cabinets, enclosures, mounting hardware, and/or all other devices required for a complete and fully functional system, whether specified herein or not. All Access Control Panels and Power Supplies will be rack mounted and installed in the server room in the designated location.

C. Section Includes:

a. Access Control and Alarm Monitoring

a. Control Panels
b. Credential Readers
c. ACAMS Field Devices
d. Intrusion Detection Panels, Glass Breaks, Motion Detectors and Keypads

b. ACAMS Cabling and Power Supplies
c. Integration with the Video Surveillance System (VSS)
d. Coordination with:

a. Division 8, Door Hardware Contractor
b. Fire Alarm Contractor
c. Elevator Contractor
d. Any other Trades

1.2 RELATED DOCUMENTS

A. Division 00 "Procurement & Contracting Requirements Group"

B. Division 01 "General Requirements"

C. Division 07 Section "Fire and Smoke Protection"

D. Division 26 Section "Cable Trays for Electrical Systems"

E. Division 26 Section "Identification for Electrical Systems"

F. Division 26 Section "Grounding and Bonding for Electrical Systems"

G. Division 26 Section "Hangers and Supports for Electrical Systems"

H. Division 26 Section "Vibration and Seismic Controls for Electrical Systems

I. Division 26 Section "Overcurrent Protective Device Coordination Study"

J. Division 27 Section "Communications Backbone Cabling"

K. Division 27 Section "Communications Equipment Room Fittings"

L. Division 28 Section "Common Work Results for Electronic Safety and Security"

M. Division 28 Section "Electronic Surveillance"

1.3 ABBREVIATIONS AND DEFINITIONS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.4 STANDARDS AND CODES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.5 SUBMITTALS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.6 SUBSTITUTIONS, DEVIATIONS AND CHANGES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.7 TRAINING

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.8 QUALITY ASSURANCE

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.9 PROJECT CONDITIONS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.10 COORDINATION

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Access Control

a. Brivo

B. Intrusion Detection

a. Bosch
b. DMP

2.2 SYSTEM DESCRIPTION

A. The ACAMS system is existing.

B. The ACAMS should utilize dedicated cabling for communication between Access Control Panels (ACM) and the security devices.

C. Access control decisions may be made locally at the access control panel in the event of loss of communication. Upon the network connectivity being restored, the stored alarms in the control panel will then be transmitted to the ACAMS server for storage and report writing.

D. The ACAMS shall utilize a structured cabling system (SCS) for communication between the ACMs and the server/workstations.

E. The ACAMS Access Control panels will be rack mountable and installed in the server room in the designated rack.

F. The network switch shall be PoE complaint and provide IEEE 802.11af power. The network switch will be provided by the Owner.

G. The Security Contractor is responsible for the coordination of the installation of the door/frame security package with the Division 8 contractor, and the coordination of Door Hardware Section of the project specifications, for the doors that require security.

H. The Security Contractor shall generate a spreadsheet as part of their submittals, identifying all the doors to receive electronic security devices and validate that the Division 8 Contactor, door hardware submittal matches the required security functions. Should a conflict in function be identified, the security contractor shall alert the Architect. The Security Contractor shall be responsible to ensure that the door hardware contractors are aware of all the required security functions of the doors requiring security.

I. Electronic locksets, Power Transfer Hinges, Door Contact, and other locking hardware for the new doors will be provided by the Door Hardware Contractor.

J. The Security Contractor shall coordinate the installation and connection of the Fire Alarm Relay to the ACAMS system, for the control of the electric locks by Fire Alarm system provided by the Electrical Contractor.

K. The Security Contractor shall coordinate their installation with all other trades and provide final termination of all cables and conductors.

L. The Security Contractor shall consult with the Owner to determine the Owner's requirements prior to programming and initialization. The Security Contractor shall transfer and/or enter all data into the ACAMS system, including, alarm point database, time zone database, employee cardholder database, reports configuration, device database, I/O database, guard tours, and any other required set-up.

M. The Security Contractor shall coordinate all the security requirements of this Section with all other trades.

2.3 FUNCTIONAL REQUIREMENTS

A. The system shall manage the entrance and exit of people through secure areas. In addition to the access control the system shall monitor specific alarm points as well as monitor and record multiple cameras.

B. To control operational security portals, the contractor shall provide Card Readers, Door Contacts, Balanced Magnetic Switches, Request-to-Exit sensors and Push Buttons, Access Control Panels, Power Supplies, Intrusion Detection Panels, Motion and Glass Break sensors, and audible/visual alarm devices, as described herein and on the contract drawings.

C. The ACAMS has the following main functions:

a. Access Control
b. Alarm Monitoring
c. ID Badging

D. The system's operating environment is a fully multi-tasking, multi-threading, Microsoft Windows Operating System. It has an integrated system utilizing a single industry standard database for data storage and manipulation.

E. The system's Graphical User Interface (GUI):

a. The existing system employs a standard Windows-based graphical user interface (GUI).
b. A mouse and keyboard shall be the primary operator interface with the system.
c. Operator screens utilize all standard Windows-style functions such as drop-down menus, context menus, radio buttons, and lists, as appropriate.

F. The system allows the configuration of multiple alarm monitoring workstations, an administrative workstation, and an integrated workstation (which shall include any combination of the above).

G. The alarm monitoring workstation is to be able to connect to and monitor field hardware devices, such as card readers and ACM's. Administrative tasks such as defining access groups, time zones, generating reports, creating maps, etc. are provided at designated workstation licensed to do so.

H. The system integrates with the other security systems provided for this facility: Video Surveillance, Intrusion Detection System, ID Badging, and Video Intercommunications System.

I. Reports: the system provides configurable data reports for database configuration, historical activity (Journal) and audit tracking. Pre-defined reports are available for download and import into the system.

2.4 SYSTEM PARAMETERS

A. The system is configured to support all card reader, cameras, and field devices, as shown on drawings and can expand and add all the new devices.

2.5 SYSTEM PERFORMANCE CRITERIA

A. Within the context of the overall system performance previously described, the system components shall be designed to operate as described herein.

a. Modularity: The Security Contractor shall provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. system components shall be designed to facilitate modular subassembly and part replacement.
b. Reliability: The Security Contactor shall provide only new, unused components free from flaws or imperfections which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five thousand (5000) hours. Provide components designed for continuous operation.
c. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged

and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the various security subsystems.

d. Availability: The Security Contractor shall provide products and services available within the project schedule established for the Contractor's Work. Delays due to a manufacturer's inability to deliver the required products and materials within the established schedule shall be regarded as a default in the Agreement between the Contractor and the Owner, subject to the terms and conditions within this Agreement governing default or terms of comparable intent.

2.6 SYSTEM SOFTWARE

2.7 ACCESS CONTROL MODULE

A. General

a. The access control module (ACM) shall be a self-contained, microprocessor-controlled field panel. The panel shall serve as the data collection and communications interface between the Host and the various field devices such as card readers, alarm inputs and control outputs. The ACM shall operate as an elevator control device. The panel shall operate in host controlled, local decision or dial-up mode. Configuration information (i.e., card records, time commands, door/monitor point/control point configuration, etc.) shall be downloaded from the host computer. Local programming at the ACM or the use of EPROMs shall not be required.

b. The ACM shall be able to communicate back with the database server through industry standard switches and routers and shall not have to be on the same subnet.

c. The ACM is required to continue to function normally (stand-alone) if it loses communication with the system software. While in this off-line state, the ACM is required to make access granted/denied decisions and maintain a log of the events that have occurred. Events shall be stored in local memory, and then uploaded automatically to the system database after communication has been restored.

d. The Access Control panels will be rack mountable and installed in the server room in the designated rack.

e. Provide all components listed below.

B. Enclosure

a. The ACM shall be housed in a locking cabinet, suitable for wall mounting or rack mounting. All cabinet locks shall be keyed alike. The cabinet shall be equipped with a tamper switch on the front door and on the back of the unit. Tamper alarms shall automatically report to the host computer when activated. The cabinet shall be suitably sized to allow installation of the panel, all expansion modules and associated field wiring. The cabinet door shall include illuminated diagnostic indicators, which shall indicate the status of the panel.

b. The ACM shall operate in a temperature range of 0°-70° C. Temperature range for use with battery backup shall be 0° - 50°C.

C. Door Controllers

a. Processor and Memory

a. The Network Door Controller's microprocessor shall be of enough speed and power to provide on-board AES 256-bit encryption without use of an external encryption device, while providing access decisions within 500 ms on a fully loaded system. The controller shall have at least 2GB of on-board memory for

cardholder and event storage. There shall be at least 16GB of on-board FLASH memory that shall be used for boot code and operating system code, and for memory backup.

b. The controller shall be able to locally store at least 500,000 card holders, using five cards/person and with 10 clearances/person, while also providing room for a transaction buffer of 10,000 alarms and events (minimum) in case communications to the host is lost.

b. Memory Retention and Real Time Clock Backup

a. The Network Door Controller must include automatic means to back up the system memory, including card holder records, configuration information, and alarm/event information, to onboard non-volatile flash memory in the event of AC power loss or Battery Low alarm. During the power interruption, the system's real time clock shall be backed up using a lithium coin cell battery such that the time is current when power is restored.

c. Dual Ethernet Network Ports

a. The Network Door Controller shall have two on-board 10/100/1Gb Ethernet ports, using standard RJ-45 connectors. The network ports must support full duplex communications. The controller must provide visual LED indication of transmit and receive activity for the Ethernet communications port. Controllers that do not offer full duplex 1Gb connectivity will not be accepted.

b. Secondary Communications, Using the dual network ports, the controller must support a primary network communications path and secondary communications path to the system server. Failover operation is described later in this document.

d. Field I/O Wiring Modules

a. The Network Door Controller shall provide terminations for field wiring using modular Door Controllers.

e. USB Communications

a. Communications from each Door Controller to the Network Door Control Card shall be made using a standard USB connection.

f. Network Connectivity

a. The Ethernet Door Module have one Ethernet port, for TCP/IP communications to the Network Door Controller. The Ethernet port shall support GigE Ethernet compatibility, as well as 10/100bT Ethernet. Door modules that do not support GigE connectivity shall not be considered. Communications to the Network Door Controller shall be encrypted with AES 256-bit encryption Filtered data for noise rejection to prevent false alarms.

g. General Inputs for the Access Controller module shall provide dedicated, normally closed inputs for:

a. Enclosure Tamper, in a wall-mount cabinet, the tamper input on the Network Door Controller shall be pre-wired to the enclosure door to report opening of the door as a tamper event.

b. Power Fail, A dedicated input shall be provided for a power failure alarm. When using an external DC power supply to power the unit, this input shall be wired to the power supply's alarm output.

c. Low Battery, A dedicated input shall be provided for a low battery alarm. When using external DC power supply to power the unit, this input shall be wired power supply's low battery alarm output.

D. Provide:
   a. Brivo

2.7 CREDENTIAL READERS

A. Card readers shall be contactless type with a wall switch reader assembly consisting of a reader antenna and integrated keypad. The reader antenna shall have the capability to be mounted directly on any standard metal or plastic single gang electrical box or on a flat wall, and a remote electronics module (all readers shall be flush mounted, where applicable, with the gang box recessed within the wall). The unitized reader/keypad with a read antenna and necessary electronics for transmission of the card code to the system all contained in a single package.

B. The reader shall operate within the temperature range of minus 30 degrees to plus 65 degrees centigrade with relative humidity of 95 percent non-condensing. Reader shall be designed to operate on low voltage AC or DC. An alarm signal shall be provided to indicate failure of any portion of this internal power supply equipment.

C. A LED on the front surface of the reader shall indicate to the user that the card or tag presented to the reader has been read. An audio beep tone to indicate that the card has been read. Visual indication that a card has been decoded and deemed valid or invalid shall be provided at each reader location by green and red LED's, respectively.

D. Standard housings shall be available for the readers. The housing color shall be submitted to architect for approval. The reader housing shall be secured to the mounting plate with tamper resistant screws.

E. The reader mounting types (wall or mullion mount), colors and finishes for each card reader location shall be coordinated and approved by Architect via submittals.

F. Provide HID RP40 or RPK40 Card Readers or approved equal.

2.8 FIELD DEVICES

A. Request-to-Exit (REX) Motion Sensor

   a. Provide passive infrared technology request-to-exit (REX) motion detectors, for the existing doors, as required.
   b. All devices shall be specifically designed for request to exit applications. Devices specifically designed for other security related applications shall be unacceptable.
   c. All REX devices shall be interconnected such that they provide a direct input into the associated network controller. Designs where REX devices are directly interconnected with door monitoring switches shall be unacceptable.
   d. REX devices installed at doors with electro-magnetic locks shall also be interconnected such that the second relay contact in the REX device is wired to interrupt power to the associated electro-magnetic lock whenever the REX device senses motion at the door.
   e. Shall have adjustable beam to ensure that the coverage does not extend to the unsecure side of door, and it is not triggered by people passing by.
   f. Finishes and mounting details at each door's location shall be coordinated with and approved by Architect.
   g. Provide Bosch DSi-150 or approved equal.

B. Request-to-Exit (REX) Pushbuttons

a. Request-to-exit pushbuttons shall be located at locations shown on contract drawings.
b. All REX devices shall be interconnected such that they provide a direct input into the associated network controller. Designs where REX devices are directly interconnected with door monitoring switches shall be unacceptable. Each push-button provided shall include an adjustable pneumatic timer. The timer shall allow the door unlock time to be adjustable from 2 to 60 seconds. (Initial set point shall be 30 seconds).
c. Finishes and mounting details at each door location shall be coordinated with and approved Architect.
d. Provide Locknetics Model 623 or approved equal.

C. Sounder

a. Voltages: Regulated 12VDC and 24DC
b. Operating Voltage Limits: 8–17.5 and 16–33 Maximum
c. Operating Current: At 12VDC– 20.8mA; at 24V– 47.4mA
d. Temperature Range: –10°C to +60°C (14°F to 140°F) 0°C to 49°C (32°F to 120°F)
e. Sound Output: 74dBA minimum @ 10 feet – 12-volt application 80dBA minimum @ 10 feet – 24-volt application
f. System Sensor PA-400 or approved equal.

D. Door Contact

a. The contact contains a hermetically sealed magnetic reed switch. Switches shall be reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finish to match door jam. Rare Earth Magnet shall be made of neodymium iron boron.
b. Contact shall be rated at 30 VDC (50 mA) for 1,000,000 cycles, minimum.
c. Housings shall be molded of flame-retardant ABS plastic. Magnetic contact switches shall be protected to deter sticking or freezing.
d. The gap distance for wood shall be 1" and steel up to ½".
e. The unit shall have a 1" diameter, with open or closed loop operation with an electrical configuration of Single Pole Single Throw (SPST).
f. Provide the Magnasphere HSS L2C Recessed / Concealed door contact.

2.9 LOCKING DEVICES

A. Electronic Strikes and Mortice Locks

a. Provided under the Division 8, Door Hardware Specifications.

2.10 INTRUSION DETECTION DEVICES

A. Intrusion Detection Panel

a. The DACS system is capable of being utilized as a combination Intrusion and Fire system per code. Fully integrated intrusion, access and fire functions allow users to interface with 1 system instead of 3.
b. Integrated Telephone Line Interface with programmable options for signaling and supervision.
c. Conettix IP based communication option to provide high-speed, secure alarm transport and control.
d. 8 programmable areas with perimeter and interior partitioning.

e. 8 on-board, class B hardwired points with expansion capability for a total of 75 wired or wireless points.
f. Compatibility with touch-screen color LCD, vacuum fluorescent, ATM style LCD or LED style Alarm Command Centers
g. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).
h. The system shall support the use of an Apple iOS device for control. Functions to include arming, disarming, control of outputs, lock, unlock, cycle and secure access doors.
i. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.
j. Provide 1.4 amps of power for standby operation and 2 amps of alarm power, both rated at 12 VDC.
k. 2 wet-contact relay outputs and 1 Auxiliary wet-contact relay output with expansion capability for up to an additional 64 dry-contact relay outputs.
l. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.
m. Supervision of peripheral devices and communications interface(s).

B. Door Contact

a. The contact contains a hermetically sealed magnetic reed switch. Switches shall be reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finish to match door jam. Rare Earth Magnet shall be made of neodymium iron boron.
b. Contact shall be rated at 30 VDC (50 mA) for 1,000,000 cycles, minimum.
c. Housings shall be molded of flame-retardant ABS plastic. Magnetic contact switches shall be protected to deter sticking or freezing.
d. The gap distance for wood shall be 1" and steel up to ½".
e. The unit shall have a 1" diameter, with open or closed loop operation with an electrical configuration of double pole-double throw (DPDT).
f. Provide the Magnasphere HSS L2C Recessed / Concealed door contact.

C. Motion Detectors

a. Electrical Current (alarm/standby) 10 mA at 12 VDC Voltage (operating) 9 VDC to 15 VDC
b. Environmental Pet Immunity 1 One or two pets up to 45 kg (100 lb) or numerous rodents
c. Relative Humidity 0 to 95%, non-condensing For UL Listed product installations 0 to 85%,
d. non-condensing Temperature (operating) G,
    a. GE models: -20° C to +55° C (-4° F to +130° F)
    b. HE models: +5° C to +40° C (+41° F to +104° F)
    c. For UL Listed product installations, 0° C to +49° C (+32° F to +120° F)
e. Mechanical Color white
f. Dimensions 105 mm x 61 mm x 44 mm (4.2 in. x 2.4 in. x 1.7 in.)
g. Material High-impact ABS plastic
h. Radio Frequency Interference (RFI) Immunity No alarm or setup on critical frequencies in the range from 150 kHz to 2 GHz at field strengths less than 30 V/m.
i. Outputs Relay Solid state, supervised, Form A normally closed (NC) contacts rated for ≤100 mA, 25 VDC, 2.5 W,
j. Provide a Bosch, ISC-BDL2-W12G

D. Glass Break

a. Electrical Current: 23 mA at 12 VDC
b. Voltage: 6 VDC to 15 VDC
c. Environmental Operating Temperature: -29° C to +49° C (-20° F to +120° F)

a. For UL Certificated installations, 0° C to +49° C (+32° F to +120 °F)

d. Radio Frequency Interference (RFI) Immunity: No alarm or setup on critical frequencies in the range from 26 MHz to 950 MHz at 50 V/m.
e. Mechanical Dimensions (Hx Diameter): 2.1 cm x 8.6 cm (0.83 in. x 3.4 in.)
f. Material: High-impact ABS plastic enclosure
g. Outputs Alarm: Form C reed relay rated 3.5 W, 125 mA at 28 VDC for resistive loads. Tamper: Normally closed (NC) cover-activated tamper switch with separate terminals. Contacts
h. Provide a Bosch DS1101I

E. Duress Push Buttons

a. Receiver Product Features Two-line text display shows condition of each transmitter, provides log of past events, and displays signal strength. Outputs can be configured in follower, latching, momentary, or toggle modes independently. Case tamper protection, jam detection and internal antennas for a secure wireless implementation.

a. Weight: 9.9 oz (280 g)
b. Power requirement: 11 - 14 VDC; 400 mA
c. Output specifications:
a) Form C relay 1A @ 28 VDC, 0.5 A @ 30 VAC resistive load;
b) N/O receiver case tamper contact closure,
c) N/C receiver jam output indication
d. Input specifications: A low is less than .5 V; a high is greater than 2.5 V.
e. Reset input: Contact closure, momentary low.
f. Number of points/transmitters: 16
g. Number of alarm outputs: Five Form C relay outputs
h. Number of fault outputs: One Form C relay output
i. Operating environment: Temperature: 32°- 140° F
j. Humidity: Up to 90% (non-condensing)
k. Provide an Inovonics system (16 port Receiver)

b. Single Button Transmitter

a. Typical battery life: 3-5 years
b. Battery type (BAT 608): Panasonic CR2 or equivalent
c. Operating environment: 0 to 60° C, up to 90% relative humidity non-condensing
d. Dimensions: 76 x 41 x 18 mm
e. Weight: 61 g
f. Operating frequency: 868 MHz
g. Output power: 25 mW
h. Firmware revision: 90486, v 3.2

2.11 ENCLOSURES FOR ESS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

B. Cabinet for ESS equipment installation in the Server Room will be provided by the Division 27 Contractor.

2.12 POWER SUPPLIES

A. The access control and lock power supplies shall be UL Listed Fire and Access Control Power Supply (UL1481, UL294). It shall be Class 2 rated and NFPA 72 compliant.

B. The lock power supply shall have a 120VAC, 60Hz input, 10 amps continuous supply current and be field selectable 12VDC or 24VDC. The unit shall contain eight individual power limited outputs. The unit shall have enough batteries to operate either magnetic locks or electrified strikes for at least four (4) hours from the time of power failure to the lock power supply.

C. The Access Control Panels and all devices connected shall be fully operational via a battery backup system. The backup system shall provide for four (4) hours of continuous operation without degradation of the system. The host shall be notified if the system goes to battery back-up.

D. The power supply for the Access Control Panel shall be dedicated only for this panel and will be provided, at each ACM location, along with a separate lock power supply.

E. The lock power supply shall provide power for each connected electric lock, request to exit motion detector, and sensors where applicable and a Fire Alarm Relay input for interface and control of the designated doors by the Fire Alarm system.

F. The power supply will have a main fuse for the protection of primary side of the power supply. In addition, each of the outputs of the power supply will be fused.

G. Each supply shall be sized such that its continuous power output rating is 200 percent of the connected load or a minimum of 100 VA whichever is greater.

H. All power supplies shall be configured for direct hardwired connection to a 120 VAC circuit.

I. All the power supplies shall be provided with a battery backup, with enough power to hold all the devices for a period of 4 hours.

J. The power supplies will be rack mountable and installed in the server room in the designated rack.

K. Provide Altronix AL600 series and AL1000 series or approved equal.

L. Provide Altronix MAXIM3D 12 VDC, 12 AH Batteries or approved equal.

2.13 UNINTERRUPTIBLE POWER SUPPLIES

A. Uninterruptible Power Supplies (UPS) for Security Servers and PoE Switches

a. Provide a rackmount in-line UPS in the MDF for the ACAMS, Video Surveillance Server and the PoE switches supporting the security systems.
b. Provide a free-standing tower or rack mounted UPS in each IDF for the supporting the IP cameras served by the IDF.
c. Back-up power duration requirements: minimum 60 minutes.
d. Meet FCC Part 15 Class B Conducted and Radiated Emission levels
e. Equipped with 19" rail mounting kit for rack mounting.
f. Equipped with network management card for remote monitoring and unattended shutdown via the data network.

g. APC Smart UPS or approved equal.

2.14 CABLES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security.

2.15 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.

C. Provide required stainless-steel hardware to fasten the two-hole ground lugs to the bus bar.

D. Ensure that dis-similar metals are treated to stop corrosions and to create a good connection.

2.16 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. All materials shall be installed as per the manufacturer's instructions, unless noted otherwise.

B. The Security Contractor shall comply with NECA 1.

C. The Security Contractor shall bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. The Security Contractor shall comply with NECA 1, "Good Workmanship in Electrical Contracting."

E. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

F. All equipment shall be installed according to manufacturers' instructions.

3.2 GENERAL

A. The Security Contractor with the General Contractor will examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. The Security Contractor will examine rough-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. The Security Contractor shall proceed with installation only after unsatisfactory conditions have been corrected.

D. The Security Contractor shall comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."

E. The Security Contractor will obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

F. The Security Contractor will record the setup of ACM features and access requirements for each new location.

G. The Security Contractor will propose start and stop times for time zones and holidays and match up access levels for all new doors.

H. The Security Contractor will set up groups, facility codes, linking, and list inputs and outputs for each Controller.

I. The Security Contractor will assign action message names and compose messages.

J. The Security Contractor will set up all new alarms, establish interlocks between the new alarms, and the intrusion detection devices.

K. The Security Contractor will update the alarm graphic maps.

L. The Security Contractor will develop and update the new user-defined fields.

M. The Security Contractor will propose setups for guard tours and key control.

N. The Security Contractor will complete system diagnostics and operation verification.

O. The Security Contractor will prepare a specific plan for system testing, startup, and demonstration.

P. The Security Contractor will develop acceptance test concept and, on approval, develop of the specific test for each set of devices.

Q. The Security Contractor will develop cable and asset management system details; input data from construction documents. Include system schematics and Visio Technical Drawings.

R. The Security Contractor will be in meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 ELECTRICAL POWER

A. The new AC power feeds to the additional ACM's and power supplies shall be installed in conduit separate from the data bus communication and low voltage control cables. The 120 VAC input power shall be furnished and installed by the Electrical Contractor. The Security Contractor shall be responsible for coordinating his requirements with the Electrical Contractor.

B. The Security Contractor shall furnish and install, in accordance with the manufacturer's instructions, all interconnect wiring, and equipment necessary for the erection of a complete Access Control and Intrusion detection system as described herein and shown on the drawings. All wiring termination, except 120 VAC power inputs and the telecommunications cabling; shall be the responsibility of the Security Contractor.

3.4 TESTING AND SYSTEM ACCEPTANCE

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

3.5 DEMONSTRATION

A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”.

B. The Security Contractor, if necessary, shall engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. Refer to Division 01 Section "Demonstration and Training”.

C. The Security Contractor will develop separate training modules for the following:

a. Computer system administration personnel to manage the databases and to update and maintain software.
b. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
c. Security personnel.
d. Hardware maintenance personnel.
e. Corporate management.

END OF SECTION 281000

SECTION 28 20 00
ELECTRONIC SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This section describes the components that shall comprise the Video Surveillance System (VSS) and practices to be used when installing these components. All information herein is intended to present minimum standards of performance, quality, and construction.

B. The system shall include all hardware and software, closed-circuit cameras, lenses, auto-iris, controls, power supplies, mounts, housings and any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, power supplies and any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, and all other devices required for a complete and fully functional system, whether specified herein or not.

C. The system shall provide a video management solution that can simultaneously record and play back video, provide automatic alarm call-ups, and activate events from the ACAMS workstations.

D. Section Includes:

1. Video Surveillance System
    a. Network Video Recorder
    b. Cameras
2. Cabling and Power Supplies
    a. Category 6A 4-UTP cables for IP cameras.

1.2 RELATED DOCUMENTS

A. Division 00 "Procurement & Contracting Requirements Group"

B. Division 01 "General Requirements"

C. Division 07 Section "Fire and Smoke Protection"

D. Division 08 Section "Door Hardware"

E. Division 08 Section "Door Schedule

F. Division 26 Section "Cable Trays for Electrical Systems"

G. Division 26 Section "Identification for Electrical Systems"

H. Division 26 Section "Grounding and Bonding for Electrical Systems"

I. Division 26 Section "Hangers and Supports for Electrical Systems"

J. Division 26 Section "Vibration and Seismic Controls for Electrical Systems

K. Division 26 Section "Overcurrent Protective Device Coordination Study"

L. Division 27 Section "Communications Backbone Cabling"

M. Division 27 Section "Communications Station Cabling"

N. Division 27 Section "Communications Equipment Room Fittings"

O. Division 28 Section "Common Work Results for Electronic Safety and Security"

P. Division 28 Section "Access Control and Intrusion Detection"

1.3 ABBREVIATIONS AND DEFINITIONS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.4 STANDARDS AND CODES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.5 SUBMITTALS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.6 SUBSTITUTIONS, DEVIATIONS AND CHANGES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.7 TRAINING

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.8 QUALITY ASSURANCE

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.9 PROJECT CONDITIONS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.10 COORDINATION

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

PART 2 - PRODUCTS

2.1 VSS DESCRIPTION

A. This specification outlines the requirements of the Video Surveillance System (VSS). All information herein is intended to present minimum standards of performance, quality, and construction.

B. The Security Contractor shall provide and install network video recorders, data storage, cameras, and power supplies. In addition, the Electrical Contractor will provide any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, and all other devices as required for a complete and fully functional system, whether specified herein or not.

C. The camera power, video and data shall run over the structured cabling system (SCS). The Security Contractor shall provide a point-to-point communications system from the camera location to the patch panel in the telecom room.

D. The network switch shall be PoE complaint and provide IEEE 802.11af power to the fixed cameras. The network switch will be provided by the Owner.

E. The Security Contractor shall coordinate with the Telecommunications and Electrical contractors for the conduit, power, and fiber optic cabling for all the exterior camera and Emergency Call Station (ECS) locations.

F. The Security Contractor is responsible to coordinate with the General Contractor (GC) for all the exterior camera poles and ECS concrete mounting stanchions.

G. The Security Contractor is responsible for the configuration and installation of all the NEMA 4 Hoffman enclosures for the exterior camera.

H. The Security Contractor is responsible to coordinate with the Telecommunications Contractor as to the locations for each camera. As the cameras will be IP, the video will be encoded locally at the camera. The camera shall utilize standard compression algorithms to reduce the video file size for compression across the data network.

I. The Security Management System (SMS) Server shall be installed, programed, and configured by the Security Contractor.

J. The Security Contractor will coordinate the installation of the Close Circuit Television (CCTV) System with all other trades and shall provide final termination and testing of all the CAT 6A cabling.

K. The Security Contractor will coordinate all the requirements of this Section with all other trades.

2.2 VSS FUNCTIONAL REQUIREMENTS

A. The VSS shall be capable of the following functions:

1. All VSS camera views shall be approved by the Owner or Owner's representative before final acceptance testing.
2. The VSS camera system power, video and data shall run over the structured cabling system (SCS), for communications and power.
3. The SCS shall run from each device to the IDF rooms and terminate into a CAT 6A patch panel. The jack in the patch panel will cross connect into the network switch located within the IDF. The Security Contractor will provide Category 6A 4-UTP patch cords for the IDF/DTE end and the camera end.
4. The network switch shall be PoE complaint and provide IEEE 802.11af power to the cameras. The network switches will be provided by the Owner.
5. The IP video streams shall be managed by the VSS server. The VSS server will serve as the virtual matrix switch for the routing of video to the various monitors.
6. The video server will provide a storage solution for the video files. The digital video shall be stored for a period of 30 days.

2.3 VSS PARAMENTERS

A. The NVRs shall have a minimum capacity of:

1. Video compression (IP camera) H.264, MPEG-4, JPEG
2. Resolution: CIF/2CIF/4CIF/720p
3. Number of cameras as shown on drawings, expandable to 128.
4. Storage shall support event recording all video at 15 frames per second for 30 days.

2.4 SYSTEM PERFORMANCE CRITERIA

A. Within the context of the overall system performance previously described, the system components shall be designed to operate as described herein.

1. Modularity: Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. System components shall be designed to facilitate modular subassembly and part replacement.

2. Reliability: Provide only new, unused components free from flaws or imperfections, which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five thousand (5000) hours. Provide components designed for continuous operation.
3. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the various security subsystems.
4. Availability: Provide products and services available within the project schedule established for the Contractor's Work. Delays due to a manufacturer's inability to deliver the required products and materials within the established schedule shall be regarded as a default in the Agreement between the Contractor and the Owner, subject to the terms and conditions within this Agreement governing default or terms of comparable intent.

2.5 NVR SYSTEM SOFTWARE

A. Software Functionality

1. Windows Operating System
2. Shall support JPEG, MPEG-4, and H.264 compression simultaneously.
3. Simultaneously record, playback and display live video without affecting other functions.
4. We will be capable to record and store image rates between 7 to 30 fps.
5. Shall include the ability to schedule the following based on the time of day:
    a. Start recording.
    b. Stop recording.
    c. Cause an alarm on motion detection in camera's field of view.
6. Video event detection capabilities. Shall have the ability to use one, several or any non-conflicting combinations of functions on a per camera basis:
7. Automatically freeze the live video of a camera with no video event in its field of view.
    a. Stop recording camera images with no video event in its field of view.
    b. Start recording images up to 3 minutes before video event is detected in the cameras field of view and continue recording for up to five minutes after the video event stopped in the cameras field of view.
    c. Per camera video event detection masking
    d. Change frame rate when video event is detected.
8. Shall have the ability record in the following resolutions at minimum 1280 x 800 pixels, alarm condition recording.
9. This should support the simultaneous display of up to 64 video streams across all connected monitors.
10. It should provide the ability to view live and recorded video on the same camera within a single application layout.
11. Shall provide a completely user-customizable 'Site View': enabling the organization of cameras, recorders, tours, and salvos into user-defined, multi-level folders, like Windows Explorer-style file organization.
12. Shall support the ability to have an Event Priority Window to display Camera Call-Up Actions associated with events in prioritization sequence based on license settings.
13. Shall support a Bi-Directional interface to enable ability to easily integrate with other 3rd party systems over a serial or TCP/IP connection.

14. Shall support database management tools which enable ability to set up rules to regulate the archival to provide enhanced support when using a Microsoft SQL Express database.

    a. Each system workstation shall be capable to:
        1) View one or more camera images from different sources.
        2) Query the history of each recorder and view images saved on disk.
        3) View, modify, or delete programming parameters of a recorder.
        4) Control the movement of all motion cameras directly with the workstation mouse (PTZ control)
        5) Export camera images to hard disk and video vault (capable of exporting multiple formats, password protected to protect chain of evidence)

    b. The NVR system shall define the programming parameters for every connected camera. For each camera it shall be possible to:
        1) Assign a name.
        2) Determine the type of camera.
        3) Assign a representative icon for identification on a graphic screen.
        4) Determine if the camera image can be visible on a video view.
        5) Determine the type of recording.
        6) Determine which events from the recorder should display an alarm message on the screen.
        7) Determine the number of pre-selections desired.
        8) Determine the number of patterns desired.
        9) Add comments to record in the video vault.

    c. The NVR shall allow for the creation of an unlimited number of video views. For each video view it shall be possible to connect to 16 cameras from various sources.

    d. The NVR shall be able to incorporate multiple cameras on the same view.

    e. The NVR shall be able to trigger, from one or more specific events, the start of a recording on a recorder with one or more cameras connected to it. The software shall allow for the creation of an unlimited number of video triggers. The software shall allow for the creation of an unlimited number of recording parameters. For each recording parameter it shall be possible to:
        1) Define a name.
        2) Select the digital video recorder to which this recording parameter refers.
        3) Select the camera to which this recording parameter refers.
        4) Associate a pre-selection or size.
        5) Determine the start recording trigger.
        6) Determine the pre-alarm time.
        7) Determine the total recording time.
        8) Determine the stop recording trigger.

    f. The NVR shall allow the playback of all recordings stored on the hard drive of any of the digital video recorders. The operator shall be able to save the video into the video vault.

    g. The NVR shall provide the operator access to the complete list of normal and abnormal events that required the activation of video recording. The sequence of images can be saved to a hard drive for subsequent consultation and shall be encrypted. The VMS shall allow the operator to access a complete list of alarm recordings in progress including origin of the alarm. The VMS shall be capable of displaying a list of exported videos.

    h. Provide a system from:
        1) Bosch
        2) Milestone
        3) Hanwha

2.6 NETWORK VIDEO RECORDERS (NVR)

A. Specification Description
1. Camera Type: IP
2. Max Number of Cameras: 64
3. Drive Single: 500 GB
4. Network Interface: 4 x 1 GigE NICs
5. RAID Controller: Yes
6. Video Storage: 36 TB
7. External Storage: iSCSI
8. Power Supply: 400W, 100~240VAC
9. Redundant Power Supply: Yes
10. Max BTU: 1000
11. Monitor Interface: 1 VGA, 1 DVI Max. Digital Monitors 1
12. Video Recording Throughput: 300 Mbps1
13. Dimensions (W x H x D): 48.3 x 8.6 x 53 cm (19 x 3.38 x 21 in)
14. Regulatory: FCC Part 15, Class A; CE: EN55022, Class A; CE: EN6100-3-2; 3-3; ICES-003/NMB-003, Class A; AS/NZS CISPR22, Class A Immunity CE: EN50130-4 CE: EN55024 Safety UL 60950-1 (2nd Ed); IEC/EN 60950-1; CSA C22.2 60950-1, UL 2900-2-3 Level 3

B. Provide:
1. Bosch NVR
2. Milestone NVR
3. Hanwah NVR
4. Or approved equal

2.7 IP CAMERAS

A. Shall be fixed high-definition IP fixed dome color cameras with dynamic bandwidth management. Cameras shall be vandal resistant, indoor, and outdoor rated, as required at each location, powered by PoE.

B. Fixed cameras shall have high resolution (min 2 MP indoor and min. 3 MP outdoor), three codecs (H.264, MPEG-4 and JPEG), dual-streaming capability and intelligent video motion detection. Cameras shall be capable to support video analytics.

C. The cameras shall have multiple mounting options, and it shall feature local monitor output jack for on-site picture and positioning adjustments.

D. Camera shall be plenum-rated, ONVIF-compliant and provide a range of options including on-board motion detection, wide dynamic range, and exposure control.

E. All cameras shall be low light, with light sensitivity of 0,3 lix color/ 0,.06 lux B/W.

F. Cameras located outside, and areas near widows shall have IR illumination and wide dynamic range capable to handle a wide range of lighting conditions in a scene enabling objects in both bright and dark areas to be visible.

G. The camera will incorporate a network video server to encode high-quality streaming video at low bit rates for transmission over an IP network, to minimize bandwidth and storage.

H. Each IP camera shall have a Real Time Clock (RTC). Network Time Protocol (NTP) support shall be available to automatically synchronize the time on the device to the other components of the NTP server.

I. All IP cameras shall support persistent connections to network video recorders (NVR). In the event of a temporary network or power loss the persistent connection must automatically be re-established with no manual intervention required.

J. There will be HD IP cameras with high-definition resolution and dynamic bandwidth management. Low light performance at 0.3 lux color and 0.06 lux B/W.

K. There should be intelligent cameras capable to detect faces in a region of interest and dynamically increasing image quality.

L. Camera shall be plenum-rated, ONVIF-compliant and provide a range of options including on-board motion detection, wide dynamic range, and exposure control.

M. The camera shall be suitable for both flush and surface type mounting. It shall feature a local monitor output jack for on-site picture and positioning adjustments.

N. Network Requirements:

1. Protocols: Telnet, RTP, HTTP, ARP, TCP, UDP, IP, ICMP, IGMPv2/v3, SNMP
2. Ethernet: 10/100 Base-T, autosensing, half/full duplex, RJ45
3. Overall unit delay:120 ms
4. Power over Ethernet: IEEE 802.3af compliant

O. Network Security

1. The IP Cameras shall incorporate onboard security to protect them from unauthorized access by supporting the following features:
    a. All network ports not used for normal functionality will be blocked to prevent network hacking.
    b. Support password protection to prevent unauthorized administration access.
    c. A Firewall will be available on each Transmitter and Receiver to allow access to specified IP addresses only. SSL and other non-IP address specific security measures are deemed insufficient.

P. Administration

1. Web page administration should be available for the configuration of all parameters on the device including:
    a. Name and location
    b. IP Address
    c. Ethernet Interface speed
2. It shall be possible to reset a unit back to Factory Default configuration without losing IP address information.
3. Administration shall also be possible using the Console serial port.
4. Diagnostics
    a. System logging shall be possible to a remote IP address, the console port, or the unit itself.
    b. Dedicated web pages for diagnostic output shall be available including:
    c. Current Media Connections (by IP address)
    d. Local System Log
    e. Registry Information (all settings)
    f. Boot Log (including boot up self-test)
    g. System Processes
    h. Device Information
    i. Interrupt Information
    j. ASIC Information

5. Network Statistics (full network statistics including dropped packets and collisions)
6. An RS232 Transmitter console port for debug output and serial configuration shall be available.
7. Telnet access for further diagnostics shall be provided and restricted to administrators with the administrator password who have an IP address specified on the Firewall.

Q. The Simple Network Management Protocol (SNMP) must be supported.

R. Provide cameras, as shown on drawings:

1. Final camera location shall be coordinated in the field at the time of installation based on the field of view approved by the Owner's Authorized Representative.
2. Provide all required mounts and accessories.
   Colors, finishes and specific mounting detail shall be coordinated with and approved by Owner Authorized Representative.
3. Provide indoor fixed and PTZ cameras and outdoor fixed and PTZ cameras.
   a. Operational Video Compression MJPEG H.264,
   b. Frame Rate H.264: 30ips 1920x1080 MJPEG: 30ips 1920x1080
   c. ONVIF-Compliant Yes
   d. Video Output 1.0 Vp-p, 75-ohm, composite, RCA service output
   e. Resolution: CIF, 4CIF, 720p, 1080P
   f. Light Sensitivity: 400 to 900 nm
   g. Day/Night: Color only Auto (true day/night)
   h. IR Illumination Optional: Yes
   i. Motion Detection: Yes
   j. Face Detection: Yes
   k. Privacy Zones: Yes
   l. Alarms: Motion, Schedule, Ethernet loss,
   m. Tamper Detection duplex, half-duplex Bi-directional duplex, half-duplex
   n. Alarm I/O N/A 2/1 2/1
   o. Video Streams 2 simultaneous streams 2 simultaneous streams 2 simultaneous streams
   p. Minimum Illumination 0.1 lux at F1.2 color; 0.03 lux b/w and 0.00 lux in IR Illuminator mode Wide angle and telephoto 0.2 lux F1.8 color and 0.05 lux b/w
   q. Wide Dynamic Range 70 dB,
   r. IR Corrected Lens Options/ Field of View (FOV) 3-9 mm motorized auto focus; IR corrected Varifocal; IR corrected.
   s. Network Interface Ethernet 10/100 Base-TX Ethernet 10/100 Base-TX
   t. Supported Protocols TCP/IP, DHCP, HTTP, ICMP, UPnP, ARP, DNS, DDNS, PPPoE, SMTP, FTP, RTSP

S. Provide:
1. Axis cameras
2. Bosch cameras
3. Hanwha cameras
4. Or approved equal

2.8 ENCLOSURES FOR ESS

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

B. Enclosures installed indoor will be NEMA 3R and Enclosures installed outdoors will be NEMA 4.

2.9 CABLES

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

2.10 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.

C. Provide required stainless-steel hardware to fasten the two-hole ground lugs to the bus bar.

D. Dissimilar metals will be treated to prevent corrosion and to create a maximum bond.

2.11 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.

B. The Security Contractor shall comply with NECA 1.

C. The Security Contractor shall bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. The Security Contractor shall comply with NECA 1, "Good Workmanship in Electrical Contracting."

E. All equipment shall be installed according to manufacturer's instructions.

F. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

3.2 GENERAL

A. The Security Contractor shall examine pathway elements intended for cables. They will check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. The Security Contractor shall examine rough-ins for LAN and control cable conduit systems to cameras, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. The security contractor shall review rack elevations for the Security, Video and LAN switches in each IDF.

D. The Security Contractor will proceed with installation only after unsatisfactory conditions have been corrected.

E. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."

F. The Security Contractor shall prepare a specific plan for video system start-up, testing, and demonstration.

G. The Security Contractor shall develop an acceptance test concept and, on approval, develop specifics of the test sheets.

H. The Security Contractor shall develop cable and asset management system details; input data from construction documents. Include system schematics and Visio Technical Drawings.

I. The Security Contractor in meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 CABLING

A. Wiring Method: The General Contractor while installing wiring in conduit and raceway except within consoles, cabinets, desks, and counters. Also, except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method will be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal conduit, raceway, and cables except in unfinished spaces wherever possible.

B. The Security Contractor shall install test and certify the LAN cables using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6A performance of completed and linked signal paths, end to end.

C. The Security Contractor shall install the cables without damaging conductors, shield, or jacket.

D. All Boxes and enclosures containing CCTV system components or cabling, and which are easily accessible to employees or to the public or have components or cable terminations, shall be provided with a lock and a tamper switch; the tamper switch will be connected to the security system.

E. All Boxes above ceiling level in occupied areas of the building shall not be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws and have a tamper switch (where required) installed and connected to the security system.

F. All wiring where exposed shall be installed in conduit, minimum 3/4" or larger, in accordance with NFPA 70 and local codes.

G. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."

H. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

I. RS-485 Cabling: Can be install at a maximum distance of 4000 feet if manufacturer's specifications are met.

J. All Fiber optic calculating shall be in conduit and adhere to the telecommunications standards for installation, termination, and testing.

3.4 ELECTRICAL POWER

A. All AC power feeds to the system shall be installed by the Electrical Contractor, in conduit separate from the video and low voltage control cables. The 120 VAC input power shall be furnished and installed by the Electrical Contractor.

B. The Security Contractor shall be responsible for coordinating all the power requirements for the CCTV system with the Electrical Contractor.

C. The Security Contractor shall furnish and install, in accordance with the manufacturer's instructions, all interconnect wiring, and equipment necessary for the installation of a complete VSS system as described herein and shown on the drawings.

D. All wiring termination: 120 VAC power inputs shall be the responsibility of the Electrical Contractor; camera cabling shall be the responsibility of the Telecommunications Contractor and ceiling, and wall mounted cameras and final cabling shall be the responsibility of the Security Contractor.

3.5 TESTING AND SYSTEM ACCEPTANCE

A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

END OF SECTION 282000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 283100

ADDRESSABLE FIRE ALARM AND DETECTION SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. Fire Alarm System devices, control panels, power supplies and remote annunciators to be provided by Securitas. All 120V circuits and communication conduit and wiring serving fire alarm system to be provided by electrical contractor (EC) as well as all rough-in conduit and boxes for flush wall and ceiling mounted devices.

B. Types of addressable fire alarm and detection systems in this section include the following:

1. Combination, Non-Coded, Addressable.

1.3 QUALITY ASSURANCE

A. Installer: Qualified with at least 5 years of successful installation experience on projects with addressable fire alarm and detection system installation work similar to that provided for project. The Contractor must be a New York State licensed Fire Alarm installer.

B. NEC Compliance: Comply with NEC as applicable to installation and construction of addressable fire alarm and detection system components and accessories.

C. UL Compliance and Labeling: Provide addressable fire alarm and detection system components which are UL-listed and labeled.

E. NFPA Compliance: Provide a fire alarm and detection system which complies with NFPA 72.

F. NYSUFPBC Compliance: Provide a fire alarm and detection system which is installed in compliance with the New York State Uniform Fire Prevention and Building Code

1.4 SUBMITTALS

A. Securitas shall provide to EC all Product and wiring requirements for the fire alarm system. Submit manufacturer's data on addressable fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operations and maintenance, suitable for inclusion in maintenance manuals. Also include project specific riser diagram, device cut sheets, device wiring diagrams, and NAC circuit load and voltage drop calculations.

PART 2 PRODUCTS

2.1 ADDRESSABLE FIRE ALARM AND DETECTION SYSTEMS

A. Equipment to be provided by EC.

1. Addressable Vesda by Xtralis, aspirating smoke detector: air aspirating smoke detector similar to Xtralis Vesda #VEA-040-A00 with relay stack module #VER-A40-STX. Provide with microbore flexible tubing (#VSP-990-300 - quantity as required - provide with required fittings) from each specified location under raised floor back to detector location within server room. Electrical Contractor shall provide tubing chase similar to Wiremold 3000 from top of raised floor to detector housing, to route tubing within wiremold.

B. Wiring Methods:

1. Conduit and Conductors: Electrical Contractor shall provide complete wiring and conduit between all equipment. Unless otherwise specified within the Installation Manual of the specific equipment being used, all field wiring shall be minimum #16 (solid) or #14 (stranded) copper conductors, installed in separate conduit, maximum 40% full, and shall be approved for use as Fire Alarm cable. All notification appliance circuits (NAC) shall be loaded no greater than 70% of full load. The maximum voltage drop allowable for NAC circuit calculation is 10%. Audible and Visible signals shall be wired on separate circuits. Conduit of proper size shall be installed from the Control Panel: Equipment to field devices.
2. All field devices shall be mounted upon U.L. Listed Electrical junction boxes.
3. All splices in field wiring shall be made in U.L. Listed Electrical junction boxes.
4. All Electrical junction boxes shall be labeled as "Fire Alarm System" with decal or other approved markings. The Fire Alarm/Life Safety Installation shall comply fully with all local, State and National Codes, and the Local Authority having Jurisdiction (AHJ).
5. Conduit shall enter into the Fire Alarm control panel backbox only at those areas of the backbox which have factory conduit knockouts.
6. All field wiring shall be completely supervised, In the event of a primary power failure, disconnect standby battery, removal of any internal modules, or any open circuits in the field wiring; an audible and visual trouble signal will be activated until the system and its associate field wiring are restored to normal condition.
7. Open cable shall be allowed above ceilings, in attics and in other areas allowing surface wiring if so approved by the Local Authority Having Jurisdiction. All cable shall be protected where entering or leaving a junction box or device box with a portable cord straight grip connector such as Bridgeport #770-4, or equal.
8. Cable shall be the type listed for Fire Alarm/Life Safety use and shall be installed per NEC Article 760.
9. Cable must be separated from any open conductors of power, or class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
10. All exposed cable below 84 inches from the surface of the finished floor, or to other locations where the cable may become exposed and/or damaged, must be within a steel conduit.
11. Conduits must also be provided in elevator shafts and hoistways. Cables within ducts or plenums must conform to the specifications of NEC Article 300-22.

12. Riser and wiring diagrams prepared by engineer are not intended as final installation drawings but only as a guide for bidding, actual riser and installation diagrams to be furnished to EC by Securitas. Install system based on final wiring drawings prepared by the manufacturer of the system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install addressable fire alarm and detection systems as indicated, and in accordance with equipment manufacturer's written instruction, latest edition of NFPA 72 and with applicable portions of NEC, and NECA's "Standard of Installation".

B. Manual Pull Stations: Unless otherwise indicated mount semi-flush in recessed back boxes with operating handles 48" above finished floor.

C. Smoke Detectors: Install detectors indicated to be ceiling mounted not less than 4 inches from a side wall to the near edge. Install detectors located on the wall at least 4 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottoms of the joists. On smooth ceilings, install detectors not over 30 ft. apart in any direction. Install detectors no closer than 5 ft. from air registers.

D. Audible Alarm Indicating Devices: Install not more than 96" above the finished floor nor less than 6" below the ceiling. Unless otherwise indicated, install horns on flush mounted back boxes with the device operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

E. Visual Alarm Indicating Devices: Install adjacent to each alarm bell or alarm horn. Install not more than 96" above the finished floor and at least 6" below the ceiling.

F. Fire Alarm Control Panel (FACP): Surface mount with tops of cabinets not more than 6 ft. above the finished floor.

G. ELECTRICAL CONTRACTOR SHALL INSTALL Vesda aspirating smoke detector and accessories per manufactures written instructions. Provide testing of detector from Xtralis Vesda certified contractor. Wall mount relay stack enclosure above Vesda detector and connect to each active alarm output terminal. Coordinate with owners fire alarm vendor (Securitas) for connecting relay outputs to Firelite fire alarm system.

3.2 INSTALLATION OF BASIC IDENTIFICATION

A. Install electrical identification in accordance with Division-26 Basic Materials and Methods Section "Electrical Identification".

3.3 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring, raceways, and electrical boxes and fittings in accordance with Division-26 specifications.

B. Install fire-stopping products for all open cables runs through fire-rated construction as specified in specification Section 260010 "Basic Electrical Requirements".

3.4 FIELD QUALITY CONTROL

A. All testing shall be performed by Securitas . EC shall assist in testing for only items provided by EC.

END OF SECTION 283100.

SECTION 28 32 26

EMERGENCY CALL STATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Emergency Call Stations, including the following:

1. Stanchion call station
2. Pole-mounted call station

1.2 RELATED SECTIONS

A. Division 01 – Section 016000 'Product Requirements'

B. Division 03 – Section 033001 'Cast-in-Place Concrete for Site Work'

C. Division 26 – Electrical.

1.3 SUBMITTALS

A. Submit under provisions of Section 013100 'Project Management and Coordination'.

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: Indicate area layout, equipment locations, details of assembly and anchorage.

D. Operation and Maintenance Data: For entire system.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company with not less than 5 years of experience in manufacturing components of the type required for this project.

B. Regulatory Requirements: Provide UL listed equipment and controls.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products as per Section 016000 'Product Requirements' and as recommended by manufacturer until installation.

1.6 WARRANTY

A. Warranty: Provide manufacturer's 2-year warranty against any defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Code Blue Corporation. 800-205-7186, 259 Hedcor Street, Holland, Michigan 49423. www.codeblue.com.

2.2 STANCHION CALL STATION

A. Model 'CB5' vandal resistant free-standing pedestal constructed of carbon steel.

1. Compliance:

a. ADA compliant ;

b. UL 60950-1 and UL 2017 listed ;

c. NFPA 72 Chapter 24 (2010) ; and

d. NEMA 4 requirements.

2. Construction:

a. The unit shall be a cylinder constructed of ASTM A500 seamless carbon steel structural tube, schedule 20, 8.625″ outside diameter x 0.25″ thick wall, at a height of 84″ and weigh approximately 190 lbs.

b. Internal anchor base plate MIG welded 2″ above the base and fabricated with a minimum of 0.5″ thick A-36 grade steel plate ; with a 4″ diameter center hole for electrical conduit access and three oblong holes on base plate in a 6″ circular bolt pattern for attachment.

c. An access door measuring 15″ H x 6.63″ W will be placed 10″ from the bottom of the base to provide access for mounting to the anchor bolts and connectivity to electrical facilities. The opening shall have a cover plate, which mounts flush and is the same steel and radius as the unit. The cover plate shall fit into the opening and have a weather-resistant gasket. The cover plate shall be held in place by two ¼-20 x 1″ counter sunk proprietary fasteners.

d. Tamper resistant proprietary fasteners manufactured for Code Blue Corporation shall be used.

e. A recessed opening shall be cut at a point beginning 37.38″ above the bottom of the unit. The opening shall be 14″ tall at the forward edge and 12.38″ tall at the rear edge, creating a 25-degree angle from the horizontal and an arc of 160 degrees in the face.

1) The opening shall be enclosed by a 7 gauge steel plate with a single opening for a communication device.

3. Electrical: 1 ampere at 24V AC with option for Power Over Ethernet.

4. Lighting:

   a. Beacon: Programmable LED strobe with up to 375 flashes per minute; deep blue UV-rated polycarbonate prismatic reflector; 5.50″ in diameter and 5.10″ high beacon (factory programmed to activate strobe for duration of a call).

   b. Faceplate light: LED light for communications device (4.5″ wide x 0.5″ high) with lifetime of 100,000 hours and rating of 100 lumens.

5. Communications: LS100/L < S2000 – VoIP speakerphone device with a single speaker

6. Finish: Powder Coat finish in Safety Blue.

7. Graphics: Engineering grade reflective vinyl in manufacturer's standard 2.75″ tall text and as selected by Architect from manufacturer's standard colors.

2.3 POLE-MOUNTED CALL STATION

A. Model 'CB2AP' vandal resistant painted carbon steel.

1. Compliance: ADA compliant ; UL 62638 ; and NFPA 72 Chapter 24 (2010)

2. Construction: 14-guage carbon steel; measuring 29.79″ high x 11.90″ wide x 4.0″ deep; weighing approx. 28 lbs; LED Beacon/Strobe with polycarbonate lens; .

3. Electrical: 4 amp at 24V DC.

4. Lighting: programmable LED strobe with up to 375 flashes per minute; deep blue UV-rated polycarbonate prismatic reflector; 7.25″ wide x 3.49″ high x 3.52″ deep beacon (factory programmed to activate strobe for duration of a call).

5. Communications: LS100/L < S2000 – VoIP speakerphone device with a single speaker

6. Finish: Powder Coat finish in Safety Blue.

7. Graphics: Engineering grade reflective vinyl in manufacturer's standard 2.75″ tall text and as selected by Architect from manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that required utilities are properly sized and in correct locations.

B. Verify that substrates are in proper condition to receive work of this section. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.2 INSTALLATION

A. Fire Alarm and Security Contractor to install units and accessories in accordance with approved shop drawings and manufacturer's printed instructions.

1. Stanchion Call Station to be installed on concrete base provided by Site Contractor.

2. Pole-Mounted Call Station to be installed on site lighting pole provided by Site Contractor.

Test for proper operation. Install in proper relationship with adjacent construction.

3.2 CLEANING AND PROTECTION

A. Clean soiled surfaces in accordance with manufacturer's instructions.

B. Protect components from damage until completion of project.

C. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION 283226

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work to be performed in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP).

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.

2. Removing existing vegetation.

3. Clearing and grubbing.

4. Stripping and stockpiling topsoil.

5. Removing above and below grade site improvements.

6. Temporary erosion and sedimentation control measures.

B. Related Sections:

1. Division 31 Section "Erosion and Sediment Control" for temporary erosion- and sedimentation-control measures.

2. Division 31 Section "Earthmoving" for soil management and Contaminated Soil Remedial Action Work Plan.

3. Division 32 Section "Temporary Construction Fencing" for temporary security and protection measures during construction.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 REGULATORY REQUIREMENTS

A. The Contractor shall comply with New York State Industrial Code Rule 53, 48 hours prior to digging. Call Dig Safely New York at 1-800-962-7962 to have public utilities painted. No excavation work is to be started until all contacted utilities have either marked their facilities or have provided an "all clear" notice.

B. Coordinate clearing Work with utility companies.

C. Coordinate Clearing work with the projects NYSDEC approved Remedial Action Work Plan (RAWP).

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

D. Prohibit heat sources, flames, ignition sources, and smoking within work zone.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist. Strip topsoil outside the RAWP limits (soils not exceeding Commercial Use Soil Cleanup Objectives [SCOs]) for reuse on the site as approved by Remediation Engineer and NYSDEC and stockpile were noted on the Construction Documents. Strip

topsoil within the RAWP limits (soils exceeding Commercial Use SCOs) and spoil in the remediation spoil area were noted on the Construction Documents. All subsoil excavated within the RAWP limits shall be spoiled in the remediation spoil area were noted on the Construction Documents. Soils handling and reuse to be coordinated with Remediation Engineer and NYSDEC.

1. Per the RAWP, as part of site preparation, staking of non-contaminated areas (areas with no soil exceedances above Commercial Use SCOs) will be performed by the Contractor, and verified by the Remediation Engineer to identify areas and prevent cross contamination.

2. Site development activities to be performed in such a way as to prevent cross contamination between contaminated and non-contaminated areas as per the RAWP.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the Erosion and Sediment Control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PROTECTION

A. Identify and protect utilities from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping. Identify and tag.

C. Verify that survey benchmark and intended elevations for the Work are as indicated.

D. Groundwater monitoring wells to be identified in the field by contractor and surveyed, as warranted. Stakes and orange snow fence to be placed 4' from the well prior to commencement of work for well identification and protection. Contractor responsible for in kind replacement of damage/destroyed wells.

E. Community Air Monitoring Plan to be performed by Remediation Engineer personnel per the RAWP to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial work activities (i.e. site clearing/soil movement).

3.4 CLEARING

A. Clear areas required for access to site and execution of Work, to a minimum depth of 6 inches.

B. Remove surface debris, signs, trees, shrubs designated plant life and grass as indicated. Remove stumps.

3.5 ROUGH GRADING

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, aboveground, and aerial utilities. Stake and flag locations.

C. Notify utility companies to paint out utility locations.

D. Excavate topsoil and subsoil from areas to be further excavated, re-landscaped, or re-graded. Comply with the requirements of the RAWP.

E. Stockpile topsoil and subsoil in areas designated on site. Remove excess topsoil and subsoil not being reused, from the site. On-site soil slotted for exportation to be properly characterized for off-site disposal as per the RAWP. Spoil excess contaminated topsoil and subsoil in the remediation spoil area noted on the Construction Documents. Soils handling and reuse to be coordinated with Remediation Engineer and NYSDEC.

3.6 CLEAN UP

A. Remove asphalt concrete paving, debris, rock larger than 1 cubic foot, all building demolition and site appurtenances and extracted plant life from the site.

END OF SECTION 311000

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work to be performed in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP).

1.2 SUMMARY

A. Section Includes:

1. Site grading, removal of topsoil and subsoil, stormwater management basin excavating, storm, sanitary and water service structure excavating, utility trench excavating, backfilling and compacting.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

2. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.

3. Division 31 Section "Erosion and Sediment Control" for temporary erosion and sediment control measures.

4. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

5. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

6. Division 33 Section "Storm Utility Drainage" for drainage of foundations and for storm utility drainage piping.

1.3 REFERENCE STANDARDS

A. New York State Department of Transportation (NYSDOT) "Standard Specifications", latest date, or as amended.

1.4 REGULATORY REQUIREMENTS

A. The Contractor shall comply with New York State Industrial Code Rule 53, 48 hours

prior to digging. Call Dig Safely New York at 1-800-962-7962 to have public utilities painted. No excavation work is to be started until all contacted utilities have either marked their facilities or have provided an "all clear" notice.

B. Due to the nature of the site as a BCP Site, all work is to be performed in accordance with the NYSDEC-approved RAWP, NYSDEC's Technical Guidance for Site Investigation and Remediation (dated 2010 [inclusive of subsequent revisions], DER-10), NYSDEC 6 NYCRR Part 375, and all other applicable Federal, State and Local Regulations.

1.5 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material 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: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

F. Fill: Soil materials used to raise existing grades.

G. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.6 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.

2. Controlled low-strength material, including design mixture.

3. Warning tapes.

B. Samples

1. Submit 10 lb. sample of each type of fill, in air-tight containers, with certified testing laboratory gradation analysis indicating materials comply with project specifications.

C. Backfill submittal, inclusive of stone, general backfill and topsoil to be submitted to Site owner representative and Remedial Engineer prior to acquisition for review and approval. Provide gradation data to the Remediation Engineer for materials for which the waiving of chemical testing is being requested (see Section 3.9) prior to importation onto the site.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

1.8 COORDINATION

A. Due to the nature of the site as a BCP Site, a meeting shall be held between Remediation Engineer, Design Team, Contractor, Subtractors (as applicable) and Owner's representative prior to the commencement of any earth movement activity to ensure it is performed in accordance with the RAWP.

B. Remediation Engineer Representative to be present on-site during earth movement activities for coordination and documentation purposes and implementation of a Community Air Monitoring Plant during ground intrusive activities.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Topsoil: Imported friable loam; free of subsoil, roots, grass, excessive amounts of weeds, large stone, and foreign matter. Excavated topsoil material may be used if it is reusable and meets requirements for topsoil.

B. Subsoil: Excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches, and debris.

C. Topsoil and subsoil material to meet environmental requirements as outlined in the RAWP. Chemical testing per the RAWP required unless approved by NYSDEC and Remediation Engineer.

2.2 FILL MATERIALS

A. All fill materials shall conform to: NYSDOT "Standard Specifications", dated January 1, 2024 or as amended. Controlled fill shall specifically meet the requirements of NYSDOT 733-04, or 733-11, or 733-14, (formerly NYSDOT 203-2.02 type B or C or 304-2.02). The use of crushed stone NYSDOT 703-02 is an acceptable alternative.See also Contract Drawings for material types, and NYSDOT Item Numbers.

B. Pipe Zone Bedding and Backfill Material: See Contract Drawings for Pipe Trench Detail.

C. Trench Backfill Material: See Contract Drawings for Pipe Trench Detail.

D. Fill material to meet environmental requirements as outlined in the RAWP. Chemical testing per the RAWP required unless approved by NYSDEC and Remediation Engineer.

2.3 ACCESSORIES

A. Geotextile Fabric: See Contract Drawings for type if any.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Notify Engineer and Owner's Representative of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

C. Identify known underground, above ground, and aerial utilities. Identify, stake and flag known utility locations.

D. Notify utility companies to paint out utility locations.

E. Stake out pipeline routes in conjunction with Owner's representative and obtain Owner's approval of proposed pipeline location prior to excavation.

F. Excavate topsoil and subsoil from areas to be further excavated, re-landscaped, or re-graded. Comply with the requirements of the RAWP.

G. Confirm that utility companies were notified prior to excavation to paint out utilities.

H. Maintain and protect existing utilities to remain.

I. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling operations.

3.2 PROTECTION OF ADJACENT WORK

A. Underpin adjacent structures, which may be damaged by excavation work, including service utilities and pipe chases.

B. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil and stockpile in areas designated by the Owner on site. Remove excess topsoil or topsoil that is not reusable from the site per the Remedial Action Work Plan. On-site soil slotted for exportation to be properly characterized for off-site disposal as per the RAWP. All topsoil impacted by contaminants is to be spoiled on-site in areas designated by the owner and as shown on the Construction Documents in compliance with the site Remedial Action Work Plan.

B. Contractor to coordinate the transportation and off-site disposal of environmentally impacted fill/soil (if warranted), including disposal facility coordination and disposal facility requirements for acceptance of the fill/soil. All soil disposal documentation to be provided to Remediation Engineer for review and approval.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil required for building foundations, construction operations, site work, and other Work. All excavated subsoil impacted by contaminants is to be spoiled on-site in areas designated by the owner and as shown on the Construction Documents in compliance with the site Remedial Action Work Plan.On-site soil slotted for exportation to be properly characterized for off-site disposal as per the RAWP.

B. Contractor to coordinate the transportation and off-site disposal of environmentally impacted fill/soil (if warranted), including disposal facility coordination and disposal facility requirements for acceptance of the fill/soil. All soil disposal documentation to be provided to Remediation Engineer for review and approval.

C. Slope banks to angle of repose or less, until shored.

D. Excavation shall not interfere with 45 degree bearing splay of any foundation.

E. Sheeting, shoring, and excavation bracing shall be provided in accordance with OSHA Requirements to suit existing soil conditions.

F. Correct unauthorized excavation at no extra cost to Owner.

G. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Project Geotechnical Engineer.

H. Stockpile subsoil in area designated on site. Remove excess subsoil or subsoil that is not reusable from site per the Remedial Action Work Plan. On-site soil slotted for exportation to be properly characterized for off-site disposal as per the RAWP. All subsoil impacted by contaminates is to be spoiled on-site in areas designated by the

owner and as shown on the Construction Documents in compliance with the site Remedial Action Work Plan.

3.5 ROCK EXCAVATION

A. Rock Excavation: When hard, durable, solid rock is encountered in the excavations, which in the opinion of the Engineer or Owner's Representative requires for its economical removal: drilling and blasting; or drilling and wedging; sledging or barring; or breaking up with a power-operated hand tool, it will be considered as rock excavation. Layered and/or weathered rock that can be readily removed with the trenching machinery will not be considered as rock excavation. If rock is encountered in the trenching operations, it shall be excavated to a depth of at least twelve (12) inches below the pipe barrel.

3.6 DEWATERING

A. Dewatering: If sub-surface water is encountered in the trenching operations, which in the opinion of the Engineer requires pumping to maintain the excavation, it shall be dewatered by pumping on a constant basis to maintain the excavation in a dry condition. All dewatering must also comply with the requirements of the Remedial Action Work Plan if encountered within the impacted portions of the site.

3.7 TRENCHES

A. Excavate for utility piping. Any excavations within the area covered by the Site Remedial Action Work Plan (RAWP) shall be governed by that plan. Excavated topsoil and subsoil governed by the RAWP are to be spoiled on-site in areas designated by the owner and as shown on the Construction Documents in compliance with the site RAWP.

B. Cut trenches sufficiently wide enough to enable installation of utilities and allow inspection.

C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.

D. Pipe Zone Bedding and Backfill Material: Material for trench bottom and backfill for the first 12" lift over the pipe shall be defined as pipe bedding material and shall be placed in maximum 6-inch lifts. Each lift shall be compacted to at least 95 percent of the Modified Proctor maximum dry density with the moisture contents within +/- 2 percentage points of optimum moisture content.

E. Trench Backfill: Backfill for piped utilities in trenches for subsequent lifts after the first 12" lift of pipe bedding material over the pipe shall be defined as Trench Backfill Material and shall be placed in maximum 6-inch lifts. Each lift shall be compacted to at least 95 percent of the Modified Proctor maximum dry density with the moisture contents within +/- 2 percentage points of optimum moisture content.

F. Support pipe and conduit during placement and compaction of bedding fill.

G. Backfill and compact trenches to the required contours and elevations using clean soils.

3.8 FILLING

A. Fill areas to contours and elevations. Use unfrozen and unsaturated materials.

B. Fill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy sub-grade surfaces.

C. Controlled fill is to be used under all building and site pavement areas at a minimum. Controlled fill shall be placed in horizontal lifts not exceeding 9 to 12 inches in loose thickness. If hand-operated compaction equipment is used, lift thickness should be limited to 4 to 6 inches. All lifts should maintain a minimum density of 95 percent modified Proctor density, as specified by ANSI/ASTM D 1557. See also the Geotechnical Report.

D. Place geotextile fabric over unstable subsoil.

E. Place and compact all other soil materials in continuous layers not exceeding 9 to 12 inches loose depth.

F. Employ a placement method so not to disturb or damage foundations, foundation perimeter drainage, foundation damp proofing, foundation waterproofing and protective cover, or utilities in trenches.

G. Maintain optimum moisture content of backfill materials to attain required compaction density.

H. Backfill against supported foundation walls.

I. Slope grade away from building at minimum 2% slope, unless noted otherwise.

J. A demarcation layer (i.e. orange snow fence and/or plastic sheeting) to be installed by the Contractor in remedial excavations areas where applicable soil clean-up objectives (SCOs) are not met to serve as a visual indicator that contamination is present beneath/behind the demarcation layer. Consult with the Remediation Engineer for the identification of these areas

3.9 TESTS

A. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557.

B. Frequency of Tests: As ordered by Project Geotechnical Engineer.

C. Due to the nature of the Site as a BCP Site, chemical testing is required for soil, course and fill identified in Section 1.5. Soil, course and fill not to exceed the allowable constituent levels for imported fill or soil for Commercial Use (provided after End of Section).

D. Chemical testing can be waived for materials to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of: i. gravel,

rock or stone, consisting of virgin material from a permitted mine or quarry; or II. recycled concrete or brick from a DEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation Standard Specifications Construction and Materials Volume 1 (2002). Gradation data for these materials to be reviewed by Remediation Engineer and approved by NYSDEC prior to importation onto the site.

3.10 TOLERANCES

A. Top Surface of Exposed Sub-grade: Plus or minus one inch.

B. Top of Topsoil: Plus or minus 1/2 inch.

Attachment: 'Appendix 5' Allowable Constituent Levels for Imported Fill or Soil

Appendix 5
Allowable Constituent Levels for Imported Fill or Soil
Subdivision 5.4(e)

Source: This table is derived from soil cleanup objective (SCO) tables in 6 NYCRR 375. Table 375-6.8(a) is the source for unrestricted use and Table 375-6.8(b) is the source for restricted use.

Note: For constituents not included in this table, refer to the contaminant for supplemental soil cleanup objectives (SSCOs) in the Commissioner Policy on *Soil Cleanup Guidance*. If an SSCO is not provided for a constituent, contact the DER PM to determine a site-specific level.

SITE SCOS

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Metals					
Arsenic	13	16	16	16	13
Barium	350	350	400	400	433
Beryllium	7.2	14	47	47	10
Cadmium	2.5	2.5	4.3	7.5	4
Chromium, Hexavalent[1]	1 [3]	19	19	19	1 [3]
Chromium, Trivalent[1]	30	36	180	1500	41
Copper	50	270	270	270	50
Cyanide	27	27	27	27	NS
Lead	63	400	400	450	63
Manganese	1600	2000	2000	2000	1600
Mercury (total)	0.18	0.73	0.73	0.73	0.18
Nickel	30	130	130	130	30
Selenium	3.9	4	4	4	3.9
Silver	2	8.3	8.3	8.3	2
Zinc	109	2200	2480	2480	109
PCBs/Pesticides					
2,4,5-TP Acid (Silvex)	3.8	3.8	3.8	3.8	NS
4,4'-DDE	0.0033 [3]	1.8	8.9	17	0.0033 [3]
4,4'-DDT	0.0033 [3]	1.7	7.9	47	0.0033 [3]
4,4'-DDD	0.0033 [3]	2.6	13	14	0.0033 [3]
Aldrin	0.005	0.019	0.097	0.19	0.14
Alpha-BHC	0.02	0.02	0.02	0.02	0.04 [4]
Beta-BHC	0.036	0.072	0.09	0.09	0.6
Chlordane (alpha)	0.094	0.91	2.9	2.9	1.3
Delta-BHC	0.04	0.25	0.25	0.25	0.04 [4]
Dibenzofuran	7	14	59	210	NS
Dieldrin	0.005	0.039	0.1	0.1	0.006
Endosulfan I	2.4[2]	4.8	24	102	NS
Endosulfan II	2.4[2]	4.8	24	102	NS
Endosulfan sulfate	2.4[2]	4.8	24	200	NS
Endrin	0.014	0.06	0.06	0.06	0.014
Heptachlor	0.042	0.38	0.38	0.38	0.14
Lindane	0.1	0.1	0.1	0.1	6
Polychlorinated biphenyls	0.1	1	1	1	1

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Semi-volatile Organic Compounds					
Acenaphthene	20	98	98	98	20
Acenaphthylene	100	100	100	107	NS
Anthracene	100	100	100	500	NS
Benzo(a)anthracene	1	1	1	1	NS
Benzo(a)pyrene	1	1	1	1	2.6
Benzo(b)fluoranthene	1	1	1	1.7	NS
Benzo(g,h,i)perylene	100	100	100	500	NS
Benzo(k)fluoranthene	0.8	1	1.7	1.7	NS
Chrysene	1	1	1	1	NS
Dibenz(a,h)anthracene	0.33 [3]	0.33 [3]	0.33 [3]	0.56	NS
Fluoranthene	100	100	100	500	NS
Fluorene	30	100	100	386	30
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6	NS
m-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
Naphthalene	12	12	12	12	NS
o-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
p-Cresol(s)	0.33	0.33	0.33	0.33	NS
Pentachlorophenol	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]
Phenanthrene	100	100	100	500	NS
Phenol	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	30
Pyrene	100	100	100	500	NS
Volatile Organic Compounds					
1,1,1-Trichloroethane	0.68	0.68	0.68	0.68	NS
1,1-Dichloroethane	0.27	0.27	0.27	0.27	NS
1,1-Dichloroethene	0.33	0.33	0.33	0.33	NS
1,2-Dichlorobenzene	1.1	1.1	1.1	1.1	NS
1,2-Dichloroethane	0.02	0.02	0.02	0.02	10
1,2-Dichloroethene(cis)	0.25	0.25	0.25	0.25	NS
1,2-Dichloroethene(trans)	0.19	0.19	0.19	0.19	NS
1,3-Dichlorobenzene	2.4	2.4	2.4	2.4	NS
1,4-Dichlorobenzene	1.8	1.8	1.8	1.8	20
1,4-Dioxane	0.1 [3]	0.1 [3]	0.1 [3]	0.1 [3]	0.1
Acetone	0.05	0.05	0.05	0.05	2.2
Benzene	0.06	0.06	0.06	0.06	70
Butylbenzene	12	12	12	12	NS
Carbon tetrachloride	0.76	0.76	0.76	0.76	NS
Chlorobenzene	1.1	1.1	1.1	1.1	40
Chloroform	0.37	0.37	0.37	0.37	12
Ethylbenzene	1	1	1	1	NS
Hexachlorobenzene	0.33 [3]	0.33 [3]	1.2	3.2	NS
Methyl ethyl ketone	0.12	0.12	0.12	0.12	100
Methyl tert-butyl ether	0.93	0.93	0.93	0.93	NS
Methylene chloride	0.05	0.05	0.05	0.05	12

Volatile Organic Compounds (continued)					
Propylbenzene-n	3.9	3.9	3.9	3.9	NS
Sec-Butylbenzene	11	11	11	11	NS
Tert-Butylbenzene	5.9	5.9	5.9	5.9	NS
Tetrachloroethene	1.3	1.3	1.3	1.3	2
Toluene	0.7	0.7	0.7	0.7	36
Trichloroethene	0.47	0.47	0.47	0.47	2
Trimethylbenzene-1,2,4	3.6	3.6	3.6	3.6	NS
Trimethylbenzene-1,3,5	8.4	8.4	8.4	8.4	NS
Vinyl chloride	0.02	0.02	0.02	0.02	NS
Xylene (mixed)	0.26	1.6	1.6	1.6	0.26

All concentrations are in parts per million (ppm)
NS = Not Specified

Footnotes:
[1] The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.
[2] The SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.
[3] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.
[4] This SCO is derived from data on mixed isomers of BHC.

END OF SECTION 312000

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 31 25 13

EROSION AND SEDIMENT CONTROL

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 RELATED SECTIONS

A. Section 312000: Site Earthwork

1.3 REFERENCES

A. Erosion and Sediment Control Guidelines: Conform to the latest edition of "NEW YORK STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL" by the New York State Department of Environmental Conservation (NYSDEC) (i.e., Bluebook). Refer to these guidelines for construction and maintenance of all items.

1.4 RESPONSIBILITY

A. Install and maintain the temporary storm water and diversion control items as shown on the drawings before starting any grading or excavation. Provide any temporary sediment and erosion control measures that may be required within limits of the Work, including any staging areas, throughout construction in conformance with the plan, and as directed by the Engineer and Owner's Representative. Place the permanent control practices required before the removal of any temporary storm water diversion and control items.

B. During construction conduct operations in such a manner as to prevent or reduce to a minimum any damage to any water body from pollution by debris, sediment, chemical or other foreign material, or from the manipulation of equipment and/or materials in or near a stream or ditch flowing directly to a stream. Any water which has been used for wash purposes or other similar operations which become polluted with sewage, silt, cement, concentrated chlorine, oil, fuels, lubricants, bitumen, or other impurities shall not be discharged into any water body.

C. In the event of conflict between these specifications and the regulation of other Federal, State, or local jurisdictions, the more restrictive regulations shall apply.

D. Comply with all applicable NYSDEC regulatory requirements.

1.5 DESCRIPTION

A. The Work shall consist of furnishing, installing, inspecting, maintaining, and removing soil and erosion control measures as shown on the contract documents or as ordered by the Engineer and Owner's Representative during the life of the contract to provide erosion and sediment control.

B. Temporary structural measures provide erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion. These are used during construction to prevent off-site sedimentation. Temporary structural measures shall be implemented as called for in the Contract Drawings and include elements such as check dams, construction road stabilization, stabilized construction entrance, dust control, earth dike, level spreader, perimeter dike/swale, pipe slope drain, portable sediment tank, rock dam, sediment basin, sediment traps, silt fence, storm drain inlet protection, straw/hay bale dike, access waterway crossing, storm drain diversion, temporary swale, turbidity curtain, water bars or other erosion control devices or methods as required.

C. Permanent structural measures also provide erosion control protection to a critical area. They are used to convey runoff to a safe outlet. They remain in place and continue to function after completion of construction. Permanent structural measures include debris basins, diversion, grade stabilization structure, land grading, lined waterway (rock), paved channel, paved flume, retaining wall, riprap, rock outlets, and stream bank protection or other erosion control devices or methods as required.

1.6 DEFINITIONS

A. Temporary structural measures:

1. Check Dam: Small barrier or dam constructed of stone, bagged sand or gravel to reduce velocity of flow.

2. Stabilized Construction Entrance: A stabilized pad of aggregate underlain with geo-textile where traffic enters a construction site to reduce or eliminate tracking of sediment to public roads.

3. Dust Control: Prevent surface and air movement of dust from disturbed soil surfaces.

4. Earth Dike: A temporary berm or ridge of compacted soil, located to channel water to a sediment trapping device.

5. Perimeter Dike/Swale: A temporary ridge of soil excavated from an adjoining swale located along the perimeter of the site or disturbed area to prevent runoff from entering a disturbed area and preventing sediment laden runoff from leaving a construction site.\

6. Pipe Slope Drain: A structure placed from the top of a slope to the bottom of a slope to convey runoff without causing erosion.

7. Rock Dam: A rock embankment located to capture sediment.

8. Sediment Basin: A barrier constructed across a drainage way to intercept and trap sediment.

9. Sediment Traps: A control device formed by excavation to retain sediment at a storm inlet or other points of collection.

10. Silt Fence: A barrier of geo-textile fabric installed on contours across the slope to intercept runoff by reducing velocity. Replace after 1 year.

11. Storm Drain Inlet Protection: A semi-permeable barrier installed around storm inlets to prevent sediment from entering a storm drainage system.

12. Storm drain Diversion: The redirection of a storm drain line or outfall channel for discharge into a sediment trapping device.

13. Temporary Swale: A temporary excavated drainage swale.

B. Permanent structural measures:

1. Diversion: A parabolic or trapezoidal swale with a supporting ridge on the lower side constructed across a slope to intercept and convey runoff to stable outlets at non-erosive velocities.

2. Grade Stabilization Structure: A structure to stabilize the grade by providing channel linings that can withstand high velocities.

3. Lined Waterway (rock): A waterway lined with stone to dispose of high velocity runoff.

4. Riprap: A layer of stone designed to protect slopes that are subject to erosion.

5. Rock Outlets: Rock placed at the outlet end of culverts, conduits or channels.

PART 2 **PRODUCTS (Not Used)**

PART 3 **EXECUTION**

3.1 WORK AREAS

A. The Engineer and Owner's Representative have the authority to limit the surface area of erodible earth exposed by earthwork operations and to direct the Contractor to provide immediate temporary or permanent erosion measures to minimize damage to property and contamination of watercourses and water impoundments. Under no circumstances will the area of erodible earth material exposed at one time extend beyond the boundaries of disturbance indicated on the plans.

B. Schedule the work so as to minimize the time that earth areas will be exposed to erosive conditions. Provide temporary structural measures immediately to prevent any soil erosion.

C. Provide temporary seeding on disturbed earth or soil stockpiles exposed for more than 14 days or for any temporary shutdown of construction. In spring, summer or early fall apply rye grass at a rate of 1 lb/ 1000 ft2. In late fall or early spring, apply certified Aroostook Rye at a rate of 2.5 lbs./ 1000 ft2. Apply hay or straw at a rate of 2 bales/ 1000 ft2 or wood fiber hydromulch at the manufacturer's recommended rate. Hay or straw shall be anchored.

D. Coordinate the use of permanent controls or finish materials shown with the temporary erosion measures.

E. All erosion and sediment control devices must be maintained in working order until the site is stabilized. All preventative and remedial maintenance work, including clean out, repair, replacement, re-grading, re-seeding, or re-mulching, must be performed immediately.

F. After final stabilization has been achieved all temporary sediment and erosion controls must be removed. Areas disturbed during removal must be stabilized immediately.

END OF SECTION 312513

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes Asphalt Paving.

1.3 DEFINITIONS

A. Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. NYSDOT: New York State Department of Transportation.

1.4 SYSTEM DESCRIPTION

A. Provide asphalt paving according to materials, workmanship, and other applicable requirements of the standard specifications of NYSDOT.

1. Standard Specification: NYSDOT

1.5 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. Qualification Data: For manufacturer.

D. Material Certificates: For each paving material, signed by manufacturers.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. The manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the NYSDOT.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indi-

cated, as documented according to ASTM E 548.

C. Regulatory Requirements: Comply with NYSDOT, requirements for asphalt paving work.

D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Quality Asphalt Pavements," unless more stringent requirements are indicated.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if sub-grade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.

2. Asphalt Top Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, or gravel.

2.2 ASPHALT MATERIALS

A. Conform to NYSDOT Standard Specifications Section 400 Bituminous Pavements.

1. Top Course: NYSDOT 1.5" 9.5 F1 Top Course, 80 Series Compaction.

2. Binder Course: NYSDOT 3.5" 19 F9 Binder Course HMA, 80 Series Compaction.

3. Asphalt Joint and Crack Filler: NYSDOT Standard Specifications Table 702-2 Asphalt Cements, Material Designation 702-0700.

4. Asphalt Emulsion – Straight Tack Coat: NYSDOT Standard Specifications Section 702-7, Table 702-8, Material Designation 702-3002 or 702-4002.

2.3 GEOTEXTILE FABRIC

A. Standard of Quality shall be Mirafi 140N with the following minimum properties:

PROPERTY	TEST METHOD	ENGLISH	METRIC
Weight - Typical	ASTM D-5261	4 oz/sy	136 g/sm
Tensile Strength	ASTM D-4632	120 lbs	534 N
Elongation @ Break	ASTM D-4632	50%	50%
Apparent Opening Size	ASTM D-4751	70 U.S. Sieve	0.212 mm
Flow Rate	ASTM D-4491	135 gal/min/sf	5500 l/min/sm
Trapezoid Tear Strength	ASTM D-4533	310 lbs	1380 N

2.4 AUXILIARY MATERIALS

A. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.

B. Joint Sealant: ASTM D 3405 or AASHTO M 301, hot-applied, single-component, polymer-modified bituminous sealant.

C. Tack Coat: Meeting NYSDOT Section 702, Table 702-7. See also notes on Construction Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-grade is dry and in suitable condition to support paving and imposed loads.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new sub-grade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Partially fill excavated pavements with asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, surface layer finished flush with adjacent surfaces.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 ASPHALT PAVEMENT PLACING

A. Machine place 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 asphalt base course in number of lifts and thicknesses indicated.

2. Spread mix at minimum temperature of 250 deg F.

3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.

4. 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 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 asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 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 asphalt course.

1. Clean contact surfaces and apply tack coat to joints.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 12 inches.

4. Construct transverse joints as described in AI MS-22, "Construction of Quality Asphalt Pavements."

5. Compact joints as soon as asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

A. General: Begin compaction as soon as placed paving will bear roller weight without excessive displacement. Compact 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.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while asphalt is still hot enough to achieve specified density. Continue rolling until asphalt course has been uniformly compacted to the following density:

1. 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.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.

2. Surface Course: 1/8 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.

E. Remove and replace or install additional asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project Site and legally dispose of them in a NYSDEC approved landfill.

1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Curbs and gutters.
2. Walks.

B. Related Sections:

1. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
2. Division 03 Section "Concrete Forming and Accessories for work related to form liners" for concrete forms and accessories when placing concrete.

1.3 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.

1.4 SUBMITTALS

A. Submit proposed mix design for approval prior to commencement of work.

B. Submit material certificates in lieu of material laboratory test reports. Material certificates shall be signed by each manufacturer and Contractor certifying that each material item complies with or exceeds requirements.

1.5 QUALITY ASSURANCE

A. Comply with requirements of the New York State Department of Transportation Standard Specifications, latest edition, Section 608, except as modified herein.

B. Inspect precast concrete for damage or defects prior to installation.

C. Perform work in accordance with ACI 301.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Conform to ACI 301 or latest versions.

1. Steel forms.

2.2 REINFORCING STEEL

A. Welded steel wire fabric Plain type, ASTM A185 in flat sheets, uncoated finish.

2.3 CONCRETE MATERIAL

A. Cement:

1. Sidewalks: C150, normal – Type 1 Portland

B. Fine and Course Aggregate: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.4 ADMIXTURE

A. Air entrained admixture: ASTM C260 or latest revisions.

2.5 ACCESSORIES

A. Construction Joints: As shown of the Contract Drawings or described in the N.Y.S.D.O.T. Specifications.

B. Expansion Joints: As shown of the Contract Drawings or described in the N.Y.S.D.O.T. Specifications.

C. Form Release Agent: Colorless material that will not stain concrete, absorb moisture or impair natural bond.

2.6 CURING AND SEALING MATERIAL

A. Water: Clean and drinkable.

B. Absorptive Mat: Burlap-polyethylene, 8 oz/sq yd, bonded to prevent separation during use.

C. Alternate Curing Method, Cure compound: Euclid Chemical Company, Kurez DR VOX, dissipating curing compound or other equivalent as approved by Engineer or Owner's Representative. Curing compound must be pressure washed off before sealant is applied.

D. Water and Salt Sealer: Prosoco, Consolideck Saltguard WB Penetrating water and salt barrier; Euclid Chemical Company, Baracade Silane 100, Silane water and salt repellent, or other equivalent as approved by Engineer or Owner's Representative.

2.7 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94

B. Sidewalks, ramps: 4,500 psi or as otherwise noted on Contract Drawings:

1. Slump: 3-inch.

C. Add air entraining agent to mix for concrete exposed to freeze-thaw cycling.

D. Submit 7-day and 28-day test results for approval, at least one (1) set a day for cast-in-place

2.8 PRECAST CONCRETE ADA COMPLIANT WARNING PADS

A. Cast Iron detectable warning plate: as manufactured by EJ Company – 800-626-4653, natural finish, or equivalent approved by Engineer or Owner's Representative.

PART 3 EXECUTION

3.1 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 paving to identify soft pockets and areas of excess yielding.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides 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.

3.4 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. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges 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 paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Do not continue steel reinforcement across construction joints or paving strips.
2. Provide tie bars at sides of paving 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 into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch or more than 1 inch 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. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius unless noted otherwise on the plans. Repeat tooling of edges after applying surface finishes. No edging to be provided on "saw cut" joints.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel 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. Ensure adequate man-power to meet delivery and placement time frames. In no case will concrete be accepted if timing from plant to placement exceeds time's allowed in referenced standards.

F. Do not add water to concrete during delivery or at Project site. 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.

I. Screed paving surface with a straightedge and strike off.

J. 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.

K. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F 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 design mixtures.

M. 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 at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in 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.

3.7 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 by screed board or by hand floating if area is small or inaccessible to screed boards. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. 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.

3.8 DETECTABLE WARNINGS

A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified on the plans

1. Tolerance for Opening Size: Plus 1/4 inch no minus.

3.9 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Cure compound: Euclid Chemical Company, Kurez DR VOX, dissipating curing compound or other engineer approved equivalent.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. 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 one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture 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 mixture. 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 mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F 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 one specimen at seven days and two specimens at 28 days.

a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

B. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Engineer or Owner's Representative, 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.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer or Owner's Representative but will not be used as sole basis for approval or rejection of concrete.

E. 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 or Owner's Representative.

F. Concrete paving will be considered defective if it does not pass tests and inspections.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

H. Prepare test and inspection reports.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer or Owner's Representative.

B. Drill test cores, where directed by Engineer or Owner's Representative, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.

B. Related Sections:

1. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.

2. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Engineer or Owner's Representative from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.

2. Do not stretch, twist, puncture, or tear joint-sealant backings.

C. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place joint sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

D. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work to be performed in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP).

1.2 SUMMARY

A. Section Includes:

1. Seeding.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

D. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

F. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, 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, from manufacturer.

C. Imported topsoil and planting soil submittals to be provided to Site owner representative and Remedial Engineer prior to acquisition for review and approval.

1.5 QUALITY ASSURANCE

A. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report 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 the soil.

B. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil, for plant beds and for lawn areas.

C. DELIVERY, STORAGE, AND HANDLING

D. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

1.6 PROJECT CONDITIONS

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required. Coordinate with other site operations to avoid conflict and damage to new work.

B. Planting season, see Contract Drawings.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from incidents that are beyond Contractor's control.

1. Lawns.

C. Remove and replace dead plant materials immediately unless required to plant in the succeeding planting season.

PART 2 PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: as noted on plans

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 6.5 to 7.5 percent, and containing not less than 5% nor more than 20% organic matter, on that portion of the sample that passes a ¼" sieve, when determined by the wet combustion method on a sample dried at 105ºC.

1. Topsoil Source: Provide imported topsoil of a well drained homogeneous texture and of uniform grade without the admixture of subsoil material and free of dense materials, hardpan, clay lumps, stones, sod, roots, and other extraneous materials harmful to plant growth.

2. Provide imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

3. Topsoil (inclusive of planting soil) to meet environmental requirements as outlined in the RAWP. Chemical testing per the RAWP required unless approved by NYSDEC and Remediation Engineer.

2.3 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 85 percent calcium carbonate equivalent, with a minimum 90 percent passing a No. 10 mesh sieve and a minimum 50 percent passing a No. 100 mesh sieve.

1. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Peat Moss: For use in Planting Soil Mixture, provide peat moss, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum peat moss or reed-sedge peat, containing not more than 9% mineral on a dry basis, conforming to NYSDOT 713-20.

D. Herbicides: EPA registered and approved, of type recommended by manufacturer.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

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 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.

2.4 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition:

a. Planting areas: 5 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.

b. Lawn areas: 30 percent nitrogen, 10 percent phosphorous, and 20 percent potassium, by weight.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

D. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 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 and hydromulching overspray.

2. Protect grade stakes set by others until directed to remove them.

B. Install 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.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.

2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil 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.

a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.

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 of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. 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.

2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 5 to 6 lb/1000 sq. ft. or as noted on the Contract Drawings.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes not exceeding 1:3 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 45 days after date of Substantial Completion.

2. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

1. Water all lawn areas at the minimum rate of 1 inch per week.

D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the 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 a grass height of 1½ to 2½ inches.

E. Post fertilization: Apply fertilizer (recommended for grass varieties planted) to lawn after first mowing and when grass is dry. Water in fertilizer.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. of lawn area.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 32 93 00

PLANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work to be performed in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP).

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Weed-control barriers.
4. Mulches.
5. Tree stabilization.

B. Related Sections:

1. Division 31 Section "Site Clearing."
2. Division 31 Section "Earth Moving."
3. Division 32 Section "Turf and Grasses"

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a 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 for type and size of plant required.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

F. Planting Area: Areas to be planted.

G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

H. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

J. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

K. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

L. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

M. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including soils.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Engineer's or Owner's Representative's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Provide quality, size, genus, species, and variety of plant material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

D. Measurements: Measure trees and shrubs 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 for height and spread; do not measure branches or roots tip-to-tip.

E. Planting Soil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil, for plant beds.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Plant Materials: Deliver freshly dug plant materials. Do not prune before delivery. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop plant materials during delivery.

C. Handle balled and burlapped plant material by the root ball.

D. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials 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 plant material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

E. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

F. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect, Engineer and Owner's Representative before planting.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required. Coordinate with other site operations to avoid conflict and damage to new work.

B. Planting season, see Contract Drawings.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from incidents that are beyond Contractor's control. Note that any plantings installed after date of substantial completion shall be noted and their respective one-year warranties shall commence to run on the day of their installation.

a. Trees.
b. Shrubs.
c. Herbaceous plants.

B. Remove and replace dead plant materials immediately unless required to plant in the succeeding planting season.

C. Replace plant materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

D. Replacement plants shall be the same size and species as specified, planted in the next growing season, with a new one-year warranty commencing on the date of replacement.

1.9 PLANT MAINTENANCE

A. Maintain plant material 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 trees as required to keep them free of insects and disease. Restore or replace damaged tree wrappings. Maintain plant material for the following period:

1. Maintenance Period: 45 days following Substantial Completion.

PART 2 PRODUCTS

2.1 TREE MATERIAL

A. General: Furnish nursery-grown trees conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, healthy, vigorous stock, free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement,

B. Grade: Provide trees of sizes and grades conforming to ANSI Z60.1 for type of trees required. Trees of a larger size may be used if acceptable to 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. Deciduous Trees: Single-stem trees with an intact leader and well-spaced structural branches oriented uniformly around a straight trunk, of a height to caliper ratio typical for the species and conforming to ANSI Z60.1 for type of tree[s] required.

1. Branching Height: ⅓ to ½ of tree height.

E. Coniferous Trees: Single-stem trees with straight trunk, pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1 for type of trees required.

2.2 SHRUBS

A. General: Furnish shrubs of the species and size specified conforming to ANSI Z60.1. Provide healthy, vigorous, well-shaped and well-rooted stock free of disease, insects, eggs, larvae and defects or disfigurement.

1. Field Grown: Provide plants with the proper minimum root ball size for the type specified with the diameter and depth to encompass enough of the fibrous and feeding root system necessary for full establishment of the plant.

2. Container Grown: Plants shall have a well-established root system reaching the side of the container so as to maintain a firm ball when the container is removed, but shall not have excessive root growth encircling the inside of the container.

2.3 HERBACEOUS PLANTS

A. General: Provide plants of the species and size indicated complying with ANSI Z60.1 that are healthy, vigorous, well-rooted and established in the container in which they are growing. Plants shall have a well-established root system reaching the sides of the container to maintain a firm root ball but shall not be pot-bound with roots encircling the inside of the container.

2.4 TOPSOIL

A. Topsoil: As per construction drawings.

1. Topsoil Source: Provide imported topsoil of a well drained homogeneous texture and of uniform grade without the admixture of subsoil material and free of dense materials, hardpan, clay lumps, stones, sod, roots, and other extraneous materials harmful to plant growth.

2. Provide imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

3. Topsoil (inclusive of planting soil) to meet environmental requirements as outlined in the RAWP. Chemical testing per the RAWP required unless approved by NYSDEC and Remediation Engineer.

2.5 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 85 percent calcium carbonate equivalent, with a minimum 90 percent passing a No. 10 mesh sieve and a minimum 50 percent passing a No. 100 mesh sieve.

1. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Peat Moss: For use in Planting Soil Mixture, provide peat moss, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum peat moss or reed-sedge peat, containing not more than 9% mineral on a dry basis, conforming to NYSDOT 713-20.

D. Herbicides: EPA registered and approved, of type recommended by manufacturer.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

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 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.

2.6 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Planting Bed Area Composition: 5 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.

2.7 MULCH

A. Plant Bed Areas: Organic mulch, free from deleterious materials and suitable as a top dressing for trees and all planting areas, consisting of ground or shredded hardwood bark, uncolored, medium size with no pieces more than 2" in their greatest dimension, and free from sawdust.

2.8 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.

2.9 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 and/or 3 inch diameter minimum red cedar stakes, by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641 (ASTM A 641M), #12 gauge galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

C. Hose Friction Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect trees from damage.

D. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.10 MISCELLANEOUS MATERIALS

A. Anti-desiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for all plant materials. Deliver in original, sealed, and fully labeled containers and mix and apply according to manufacturer's instructions.

B. Root Ball Wrap: Natural or untreated burlap. Treated or rot-resistant burlap that retards decomposition and will bind with the soil after decomposition is acceptable. Plastic or poly tree ball wrap is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out individual tree locations and areas for multiple plantings. Stake locations, outline areas, and secure Engineer's or Owner's Representative's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING BED PREPARATION

A. Loosen sub-grade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to sub-grade before loosening.

2. 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. Mix lime with dry soil before mixing fertilizer.
c. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or sub-grade is frozen, muddy, or excessively wet.
d. Spread approximately one-half the thickness of planting soil mix over loosened sub-grade. Mix thoroughly into top 4 inches of sub-grade. Spread remainder of planting soil mix.
e. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.4 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Mix soil amendments and fertilizers with topsoil as necessary to meet applicable ASTM standards.

1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.

3.5 EXCAVATION FOR TREES

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

1. Balled and Burlapped Trees: Excavate approximately 2 times as wide as ball diameter and equal to ball depth, plus the following setting layer depth:

a. Setting Layer: Allow 6 inches of planting soil.

2. Container-Grown Trees: Excavate to container width and depth, plus the following setting-layer depth:

a. Setting Layer: Allow 6 inches of planting soil.

B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.

C. Obstructions: Notify Engineer or Owner's Representative if unexpected rock or obstructions detrimental to trees are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes into free-draining strata, and backfill with free-draining material.

D. Drainage: Notify Engineer or Owner's Representative if subsoil conditions evidence unexpected water seepage or retention in tree pits.

E. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees.

3.6 PLANTING TREES

A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated on Drawings.

1. Place stock on setting layer of compacted planting soil.

2. Ball Supporting Devices: Remove burlap from tops of balls and partially from sides, but do not remove from under balls. Loosen organic or natural rope or twine from the top of the ball. Synthetic twine or rope shall be removed completely. Remove wire baskets by cutting the lowest wires before setting the tree, leaving remaining wires to hold the ball intact. Once the ball is set in place, cut and remove remaining wires. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.

3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Dish and tamp top of backfill to form a 3-inch high mound around the rim of the pit. Do not cover top of root ball with backfill.

3.7 TREE PRUNING

A. Prune, thin, and shape trees according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, Engineer or Owner's Representative, do not cut tree leaders; remove only injured or dead branches from flowering trees.

3.8 TREE GUYING AND STAKING

A. Upright Staking and Tying: Stake trees as required to prevent wind tip-out and for container planted trees and trees in exposed and windy locations. Use a minimum of 3

stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 3 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.9 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Organic Mulch: Apply average thickness of organic mulch and finish level with adjacent finish grades to thicknesses indicated on the Contract Drawings.

3.10 GROUND COVER PLANTING

A. Set out and space ground cover as indicated on the Contract Drawings.

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

3.11 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.

1. When deciduous trees are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.

3.12 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property. . On-site soil slotted for exportation to be properly characterized for off-site disposal as per the RAWP. Consult Remediation Engineer for disposal of surplus soil and waste material.

END OF SECTION 32900

SECTION 33 11 00

WATER UTILITIES

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building.

1.3 REFERENCED STANDARDS

A. New York State Department of Transportation (NYSDOT) "Standard Specifications" latest amendment.

B. American Water Works Association, WW.

C. WW C151 - Ductile Iron Pipe.

D. WW C104 - Cement Lining.

E. WW C500 – Gate Valves for Water and Sewerage Systems.

F. "Recommended Standards for Water Works", dated 1997, as amended.

G. Occupational Safety and Health Administration, OSHA, Standards 29 CFR, Section 1926, Subpart P and its latest revision.

1.4 SUBMITTALS

A. General: Submit the following.

1. Product data for pipe materials, pipe fittings, valves, and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

2. Product data for water service piping specialties. Provide component sizes, rough-in requirements, service sizes and finishes.

3. Manufacturer's certificates.

4. Project record documents. As built record drawings at project closeout of installed water service piping and products.

5. Spare parts and maintenance materials.

6. Warranties.

1.5 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local health department and environmental agency regulations pertaining to water service systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to water service and fire protection.

C. All water service system components shall be installed in accordance with applicable plumbing code requirements and in accordance with all license requirements.

D. All water service construction shall be subject to inspection by the Engineer or Owner's Representative prior to backfilling.

E. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. National Sanitation Foundation (NSF).

2. Underwriters Laboratories (UL).

1.6 PROJECT CONDITIONS

A. Location of Water Service Piping: The location, elevations, and grades of water service piping are shown on the Drawings and shall be adhered to as closely as possible. If, during construction of the project, it becomes necessary to make changes in the location or grades, the Engineer or Owner's Representative will issue appropriate directions after being contacted by the Contractor.

B. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with original design and referenced standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the General Conditions.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

E. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

F. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

G. Protect flanges, fittings, and specialties from moisture and dirt.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate connection to existing water systems.

B. Coordinate with interior building water service piping.

C. Coordinate with other utility work.

D. Interruption of Existing Water Distribution Service: Do not interrupt service to facilities occupied unless permitted under the following conditions and then only after arranging to provide temporary water distribution service according to requirements indicted:

1. Notify Engineer or Owner's Representative and Owner no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of water-distribution service without Owner's written permission.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicted, selection is Installer's option.

B. Ductile Iron Water Pipe: Shall be Class 52, cement lined rated for 350 psi minimum working pressure conforming to ANSI/WW C110/21.10 and their latest revisions. Pipe shall be manufactured by Griffin Pipe Products, Co. Florence, New Jersey (712) 325-5131 or approved equivalent.

C. Bell and Barrel Casketed Joint: Shall be "TYTON JOINT" type, trademark of U.S. Pipe and Foundry Co., and shall conform to the requirements of ANSI/WW C110/21.10 and their latest revisions.

D. Mechanical Joints and Fittings: Shall conform to the requirements of ANSI/WW C110/21.10 and their latest revisions.

2.2 VALVES

A. General: Ductile iron by Mueller or approved equivalent.

B. Non-rising Steam Gate Valves 4 Inches and Larger: Town of Amsterdam, NY Standard, WW C509, iron body, bronze mounted, resilient seated, bronze stem, 200-psi working pressure, mechanical joint ends unless otherwise required by Town Standard.

C. Valve Boxes: Cast iron box having top section and cover with lettering "WATER", bottom section with base of size to fit over valve and barrel approximately 5-1/4 inch inner diameter, and adjustable cast iron extension of length required for depth of bury of valve. Provide steel tee handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.

2.3 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION-WATER LINE BURIED BELOW".

2.4 INSPECTION OF MATERIALS

A. The manufacturers of materials shall furnish the Engineer Certificate of Inspection, certified by factory inspector, or reports of tests made by an independent testing laboratory, in three copies, showing that materials furnished conform to applicable specifications set out herein. Each inspection certificate or laboratory report shall identify the materials by number of pieces shipped and date of invoice.

B. Careful field inspection shall be made of all material before installation, and any material found to be damaged in shipment or not meeting the requirements of the Specifications will be rejected and replaced.

PART 3 EXECUTION

3.1 EARTHWORK

A. Refer to Division 31-Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 SURVEY, LINES, AND GRADES

A. The Contractor will be responsible for the proper execution of the work to the lines and grades established. The Contractor is to retain the services of New York State Licensed Land Surveyor to provide stakeout of lines and grades per the Engineer's Design.

B. The Contractor shall take every precaution to protect all stakes and should replacement become necessary, it shall be done at the Contractor's expense. The Contractor shall also furnish for himself such lines and grades that he may need for construction purposes, including blue top grade stakes.

C. Setting of grade by use of laser instrument or device is required. Laser instruments shall be used in accordance with manufacturer's recommendations.

D. The Contractor will maintain an adequate power supply and provide continuous power ventilation in the pipe line in accordance with the laser equipment manufacturer's recommendations as directed whenever the laser equipment is in use.

E. The adjustment of the laser equipment for accuracy shall be made by qualified personnel using surveying instruments at the start of each day's pipe lying and at any time during the day deemed necessary by the Engineer or Owner's Representative to assure accuracy of the laser equipment.

F. It is the Contractor's sole responsibility for the accuracy of the laser equipment, and any section of pipe found to be at the wrong grade or to have settled shall be dug up and re-laid to the satisfaction of the Engineer or Owner's Representative at the Contractor's sole expense.

G. As-built elevations shall be established by the Contractor at each fitting and furnished to the Engineer or Owner's Representative.

3.3 PREPARATION OF FOUNDATION FOR BURIED WATER SERVICE

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with pipe zone bedding and backfill material as indicted on the Contract Drawings.

C. Remove rock to minimum depth identified in Section 310000 Earthwork, or as deemed necessary by Engineer or Owner's Representative, at the surface upon which pipes are to be laid, and backfill with pipe zone bedding and backfill material as indicted on the Contract Drawings.

D. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped pipe zone bedding and backfill material. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.4 INSTALLATION, GENERAL

A. General Locations and arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground water service piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicted, to the extent practical. If, during construction of the project, it becomes necessary to make changes in the location or grades, the Engineer or Owner's Representative will issue appropriate directions after being contacted by the Contractor.

B. Install piping beginning at low point of systems, true to grades and alignment indicted with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected.

3.5 SEWER RELATION TO WATER MAINS

A. Horizontal Separation: Whenever possible, sewers should be laid at least 10 feet, horizontally, from any existing or proposed water main. Should local conditions prevent lateral separation of 10 feet, sewer may be laid closer than 10 feet to water main if:

1. It is laid in a separate trench, or;

2. It is laid in the same trench with the water mains located at one side on a bench of undisturbed earth, and if;

3. In either case the elevation of the top (crown) of the sewer is at lest 18" below the bottom invert of the water main.

B. Vertical Separation: Whenever sewers must cross water mains, the sewer shall be laid at such an elevation that the top of the sewer is at lest 18" below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with push-on joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

C. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of slip-on or mechanical-joint ductile iron pipe, and the sewer constructed of mechanical-joint ductile iron pipe and both pressure tested to assure water tightness.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. Push-on Joints: Make joints with rubber ring and sterile lubricant. The materials used shall be free of water, oil, tar, grease or other foreign substances.

B. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.7 WATER PIPE INSTALLATION, GENERAL

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Use brass wedges at pipe joints to provide continuous metal to metal connection, to assist in future pipe locating by electronic means.

3.8 INSTALLATION OF IDENTIFICATION TAPE

A. Install continuous plastic underground warning tape during backfilling of trench for underground water service piping. Locate 12 inches below finished grade, directly over piping.

3.9 FIELD QUALITY CONTROL

A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

B. Place plugs in ends of uncompleted pipe at the end of the day or whenever work stops.

C. Flush piping to remove collected debris.

D. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

E. Make inspections after pipe has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

F. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and re-inspect.

3.10 TESTING OF WATER MAINS

A. Installation and testing of the proposed water mains shall be inspected and certified to the Engineer or Owner's Representative. The Contractor shall notify the Engineer or Owner's Representative 48 hours prior to commencing work, and again 48 hours prior to performing the required testing.

B. After completion of construction and before any user is permitted to connect, the water main shall be tested for pressure and leakage in accordance with Section 4 of AWWA C600. The pressure for said testing shall be 150 psi, or 1.5 times the working pressure of system, as minimum. The allowable leakage shall be as defined in Section 4.1.6 of said AWWA Standards, as amended.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 33 41 00

STORM DRAIN SYSTEM

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. Storm sewer piping
2. Catch basins
3. Appurtenances to above materials

B. Related Sections:

1. Division 31 Section “Earth Moving”
2. Division 32 Section “Asphalt Paving”

1.3 SUBMITTALS

A. General: Submit the following.

1. Product data for drainage piping specialties.
2. Shop drawings for each of the precast concrete storm drainage structures, including cast iron frames, grates and covers.
3. Manufacturer's certificates.
4. As built record drawings at project closeout of installed storm sewerage piping and products.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins according to Manufacturer's written rigging instructions.

1.5 QUALITY ASSURANCE

A. Utility/Environmental Compliance: Comply with applicable jurisdictional authorities and regulations and standards pertaining to storm sewerage.

B. All storm sewer system components shall be installed in accordance with applicable plumbing code requirements and in accordance with all license requirements.

C. All storm sewer construction shall be subject to inspection by the Owner/Owner's Representative prior to backfilling.

1.6 PROJECT CONDITIONS

A. Location of Sewers and Sewer Structures: The location, elevation, and grades of sewers and sewer structures are shown on the Drawings and shall be adhered to as closely as possible. If during construction of the project, it becomes necessary to make changes in the location or grades of the sewers, the Engineer or Owner's Representative will issue appropriate directions after being contacted by the Contractor.

B. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping may be installed in compliance with original design and referenced standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with other utility work.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated, provide as indicated on plans.

B. Polyethylene Storm Sewer Pipe and Fittings:

1. Plastic storm sewer pipe shall be smooth interior corrugated polyethylene type pipe, Type ADS N-12 as manufactured by Advanced Drainage Systems, Inc. of Columbus, Ohio or approved equivalent. Pipe and fittings shall be made of polyethylene compounds which conform with the physical requirements of Type III, Category 3, 4 or 5, P23, P33 or P34, Class C per ASTM D-1248 with the applicable requirements defined in ASTM D-1248.

2. Polyethylene (HDPE) Plastic Pipe and Fittings, ADS N-12 ProLink WT Couplers.

C. Couplings: Rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined or

1. Sleeves: ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

2. Bands: Stainless steel, one at each pipe insert.

2.2 CONCRETE AS CONTROLLED BACKFILL

A. General: Concrete shall conform to NYSDOT Standard Specification 500.

2.3 MORTAR

A. General: Mortar shall consist of one part cement and two parts sand by volume. The cement and sand shall be thoroughly mixed dry in clean, tight mortar boxes, and afterward the proper quantity of water shall be added, and mixing completed. Only enough mortar for immediate use shall be mixed. Mortar which has started to set shall not be used, and no re-tempering of mortar thus set will be allowed.

B. Materials for use in mortar shall conform to the following requirements:

1. Cement: Cement shall conform to the Standard Specifications for Portland Cement, ASTM Serial Designation C150 with latest amendments.

2. Sand: Sand shall be sharp, clean, free from deleterious substances and shall be uniformly graded and shall conform to the "Standard Specification for Aggregate for Masonry Mortar", ASTM C144 with the latest amendments.

3. Water: Water used in making mortar or concrete shall be clean and free from oil, alkali, sugar or other deleterious substances. When potable water is in reach, no other water shall be used.

2.4 INSPECTION OF MATERIALS

A. The manufacturers of materials shall furnish the Engineer and Owner's Representative a Certificate of Inspection, certified by factory inspector, or reports of tests made by an independent testing laboratory, in three copies, showing that materials furnished conform to applicable specifications set out herein. Each inspection certificate or laboratory report shall identify the materials by number of pieces shipped and date of invoice.

B. A careful field inspection shall be made of all material before installation, and any material found to be damaged in shipment or not meeting the requirements of the Specifications will be rejected and replaced.

PART 3 EXECUTION

3.1 SURVEY, LINES, AND GRADES

A. The Contractor will be responsible for the proper execution of the work to the lines and grades established. The Contractor is to retain the services of a New York Licensed Land Surveyor to provide stakeout of lines and grades per the Design.

B. The Contractor shall take every precaution to protect all stakes and should replacement become necessary, it shall be done at the Contractor's expense. The Contractor shall also furnish for themselves such lines and grades that he may need for construction pur-

poses, including blue top grade stakes.

C. Setting of grade by use of a laser instrument or device is required. Laser instruments shall be used in accordance with manufacturer's recommendations.

D. The Contractor will maintain an adequate power supply and provide continuous power ventilation in the pipe line in accordance with the laser equipment manufacturer's recommendations as directed whenever the laser equipment is in use.

E. The adjustment of the laser equipment for accuracy shall be made by qualified personnel using surveying instruments at the start of each day's pipe laying and at any time during the day deemed necessary by the Engineer and Owner's Representative to assure accuracy of the laser equipment.

F. It is the Contractor's sole responsibility for the accuracy of the laser equipment, and any section of pipe found to be at the wrong grade or to have settled shall be dug up and relaid to the satisfaction of the Engineer and Owner's Representative at the Contractor's sole expense.

G. As-built elevations shall be established by the Contractor at each fitting and furnished to the Engineer and Owner's Representative.

3.2 PREPARATION OF FOUNDATION FOR BURIED STORM SEWERAGE SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with pipe zone bedding and backfill material as indicated on the Contract Drawings.

C. Remove rock to a minimum depth of eight inches, or as deemed necessary by Owner's Representative, at the surface upon which pipes are to be laid and backfill with pipe zone bedding and backfill material as indicated on the Contract Drawings.

D. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped pipe zone bedding and backfill material. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.3 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground storm sewerage system piping. The location and arrangements of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical. If, during construction of the project, it becomes necessary to make changes in the location or grades of the sewers, the Engineer and Owner's Representative will issue appropriate directions after being contacted by the Contractor.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 0.5 percent, except where indicated otherwise.

F. Extend storm sewerage system piping to connect to building storm drains, of sizes and in locations indicated.

3.4 PIPE AND TUBE JOINT CONSTRUCTION AND INSTALLATION

A. Polyethylene (HDPE) Plastic Pipe and Fittings, ADS N-12 ProLink WT Couplers as follows:

1. Join pipe with O-ring gasketed fittings meeting the requirements of ASTM F477 utilizing N-12 ProLink WT ProLink Couplers that meet ASTM D3212. Install according to ASTM D 2321.

3.5 PRECAST CONCRETE STRUCTURES

A. Structures shall be of the dimensions shown on the Drawings, as specified, or as required to meet field conditions.

B. Steps shall be as specified and as shown on the Drawings.

C. Cast iron frames, grates and covers shall be set to the proper elevation in a full bed of mortar. The frame shall be completely mortared onto the manhole as shown on the Drawings.

D. Each structure shall be constructed as soon as practicable after its location in installing the sewers has been reached, and after the Engineer and Owner's Representative has approved the excavation and bedding.

E. During these operations, the flow of storm water runoff shall be maintained.

3.6 FIELD QUALITY CONTROL

A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is

completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

3. Flush piping between manholes, if required by local authority, to remove collected debris.

B. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections of pipe between manholes/fittings, after pipe has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and re-inspect.

C. Water Tightness of Sewer Structures: It is the intent of the Drawings and these Specifications that the completed storm sewer lines shall be as soil-tight and free from infiltration as practical. All visible leaks or points of infiltration shall be repaired.

END OF SECTION

SECTION 34 60 13

ELECTRICAL CAR CHARGING STATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric car charging stations, including the following:

1. Dual-port chargers (Level 2)
2. Fast chargers (Level 3)

1.2 RELATED SECTIONS

A. Division 033001 – Cast-in-Place Concrete for Site Work

B. Division 26 – Common Work Results for Electrical.

1.3 SUBMITTALS

A. Submit under provisions of Section 013100 – Project Management and Coordination.

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: Indicate area layout, equipment locations, details of assembly and anchorage.

D. Operation and Maintenance Data: For entire system.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company with not less than 5 years of experience in manufacturing components of the type required for this project.

B. Regulatory Requirements: Provide UL listed equipment and controls.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products as recommended by manufacturer until installation.

1.6 WARRANTY

A. Warranty: Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: ChargePoint, 240 Hacienda Avenue, Cambell CA 95008-6617 ; Tel (408) 841-4500 ; sales@chargepoint.com ; chargepoint.com .

B. Requests for substitutions will be considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 DUAL-VEHICLE CHARGERS (LEVEL 2)

A. Model 'CT4021-CCM' dual-port 6′ bollard charging station with 18' charging cables, 7.2 KW with Bollard Concrete Mounting Kit – capable of providing up to 30 A at 208-240 VAC, single phase, 50-60 Hz.

1. Voltage: 208-240 VAC, single phase. Requires dedicated, 2 pole, non-GFCI 40A breakers.

2. Height: 71.3 inches

3. Connector Type: SAE J1772

4. Connectivity: Integral Modem ('-GW1')

5. Compliance:
   a. Safety: UL2231-1, UL2231-2, NEC Article 625.
   b. EMC: FCC Part 15, Class A.

6. Environmental
   a. Operating Temperature: -40 to 122 F (-40 C to +50 C) ambient.
   b. Operating Humidity: Up to 85% @ 122 F (50 C) non-condensing.

2.3 FAST-VEHICLE CHARGERS (LEVEL 3)

A. Model 'CPF50-L18-PEDMNT-CMK-Dual' : dual-port Pedestal 12 KW charging station with 18' charging cables and Cable Management Kit.

1. Voltage: 208-240 VAC, single phase 50A input current, requiring dedicated, 2 pole, non-GFCI 70A/80A breakers.

2. Height: 71.3 inches (to top of cable management kit).

3. Connector Type: SAE J1772

4. Compliance:
   a. Safety: UL2231-1, UL2231-2, NEC Article 625.
   b. EMC: FCC Part 15, Class B.

5. Environmental
   a. Operating Temperature: -40 to 122 F (-40 C to +50 C) ambient.
   b. Operating Humidity: Up to 85% @ 122 F (50 C) non-condensing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that required utilities are properly sized and in correct locations.

B. Verify that substrates are in proper condition to receive work of this section. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.2 INSTALLATION

A. Install units and accessories in accordance with approved shop drawings and manufacturer's printed instructions. Test for proper operation. Install in proper relationship with adjacent construction.

B. Follow requirements outlined in the attached forms:

1. 'CT4000 Construction Signoff Form' for installation of Level 2 chargers.

2. 'CHF50 Construction Signoff Form' for installation of Level 3 chargers.

3.2 CLEANING AND PROTECTION

A. Clean soiled surfaces in accordance with manufacturer's instructions.

B. Protect components from damage until completion of project.

C. Touch-up, repair or replace damaged products after Substantial Completion

ATTACHMENTS:

a. 'CT4000 Construction Signoff Form'

b. 'CHF50 Construction Signoff Form'

END OF SECTION 346013

Sales Order Number (SO#)
_____

CT4000 Construction Signoff Form

This form is required to ensure the site for your ChargePoint EV charging station(s) has been prepared as specified, by you or by your chosen contractor, before beginning your charging station installation. Submit this completed form, and the photos specified at the end, to installdispatch@chargepoint.com. The detailed data sheets, site design guides, and installation guides defining ChargePoint specifications are online at: chargepointuniversity.com.

IMPORTANT: All installations must comply with all applicable codes. ChargePoint provides concrete pedestal guidance in the *CT4000 Site Design Guide* that is applicable for most sites; however, the size for a given site might be different due to site conditions. Ensure site drawings have been completed and approved by a structural engineer for this site.

Note: If your station installer arrives to install your station and finds these items incomplete, you will incur a separate re-dispatch charge.

Site Information	Contractor Information
Site Address:	Company Name:
	Site Lead Name:
Number of CT4000 stations to be installed Pedestal: Wall:	Site Lead Job Title:
Contact Name:	Site Lead Email:
Contact Phone:	Site Lead Phone:
Contact Email:	Date Work Began:

Take the following photos throughout the site construction process.

	Required Pictures
☐	1. Concrete pad showing anchor bolts, conduit, and wire for each station -or- Wall station location with flex conduit and wire for each station
☐	2. Overall space around the concrete pad, showing all service clearances are available
☐	3. The electrical panel's specification label, to show total panel capacity
☐	4. The open electrical panel with the dead front panel removed, showing terminations
☐	5. The open electrical panel with the dead front panel on, showing breaker amperage ratings and labels for CT4000 connections

Sales Order Number (SO#)
_____

Civil Work – Pedestal Mount

☐ 1. A new concrete pad was either designed and approved by a structural engineer for this specific site, or is a newly poured pad with:
- At least 600 mm (24 in) on each side, including underground.
- Follows one of the three recommended pedestal patterns in the Site Design Guide.
- Concrete 2500 PSI minimum.

-or-

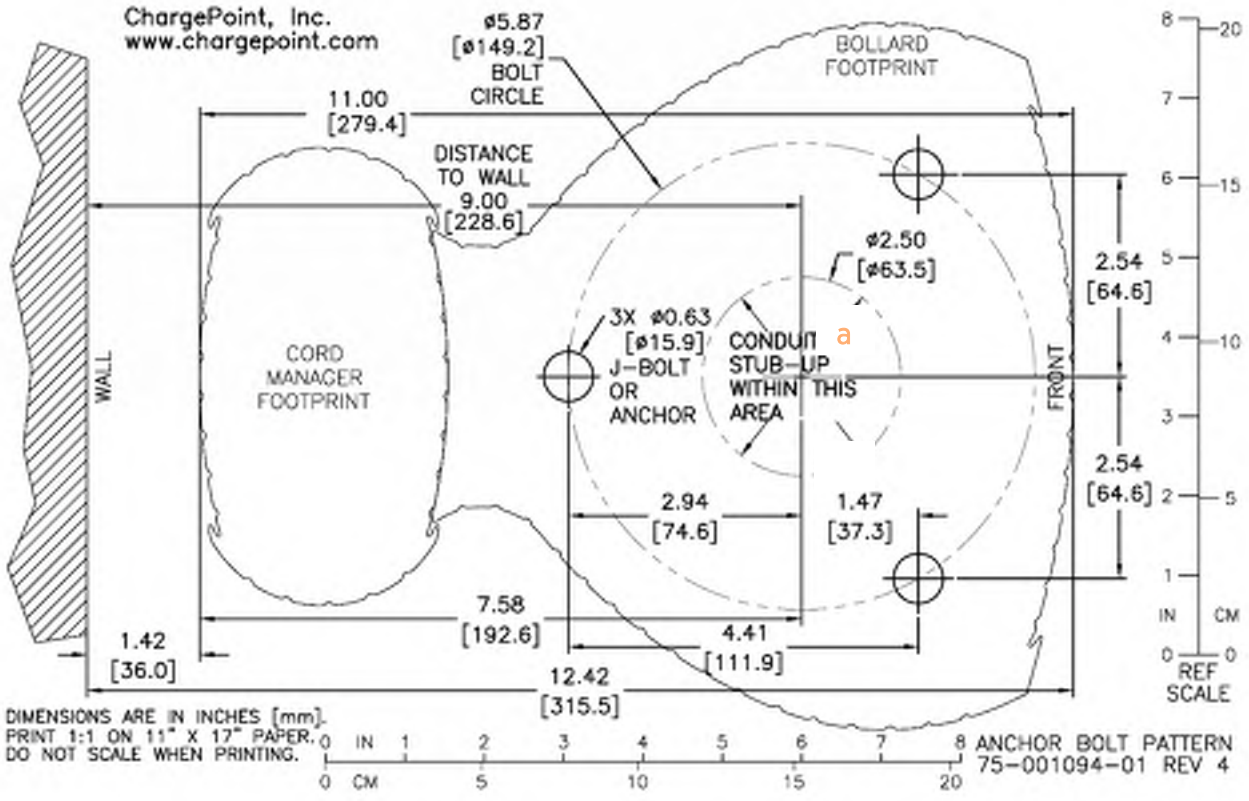
An existing concrete pad with:
- A minimum concrete volume of 0.23 m^3 (8 ft^3).
- A minimum concrete depth of least 150 mm (6 in) thick.
- Mounting bolts positioned at least 153 mm (6 in) from the edges of the pad when measured from the center of any bolt.

☐ 2. Three anchor bolts extend 75 mm +/- 6 mm (3 in +/- ¼ in) above the concrete, with two bolts in the front and one bolt behind the conduit stub-up. Bolts are plumb and secure in concrete or epoxy.

☐ 3. The center of the conduit stub-up (a) is at least 228 mm (9 in) from obstructions to the rear.

☐ 4. Conduit extends 300-600 mm (12-24 in) above the concrete.

☐ 5. Walls, fences, or slopes do not prevent water from draining from the pad.



Sales Order Number (SO#)
_____

Civil Work – Wall Mount

- ☐ 1. Conduit brings wire to the station.
- ☐ 2. 900 mm (3 ft) of wire is provided for installation.

Electrical Work

- ☐ 1. Electrical infrastructure has been completed in accordance with all applicable codes and ChargePoint specifications.
- ☐ 2. A dual-pole 40 A non-GFCI circuit breaker feeds each port (unless planning for Power Management).
- ☐ 3. Each circuit breaker is new or in good working order.
- ☐ 4. Breakers are correctly labeled in the panel.
- ☐ 5. Only bonded neutral systems are used.

System Type	Select
120/240 VAC 1Ø bonded neutral	☐
120/208 VAC 3Ø WYE bonded neutral	☐
120/240 VAC 3Ø Delta center tap-grounded bonded neutral	☐

- ☐ 6. The station mounting location has been tested for cellular coverage and shows an RSRP of -90 dBm or better (and an RSRQ of -10 or better).

Installation Readiness

- ☐ 1. All station boxes are delivered, available, and contents are undamaged.
- ☐ 2. If circuit sharing, the PowerShare Kit has been delivered (one kit per station).

I,_____, hereby certify that the scope of work in this form has been correctly completed.

Signature	***Date***

Construction Signoff Form

CPF50 Networked Charging Station

This form is required to ensure the site for your ChargePoint EV charging station(s) has been prepared as specified, by you or by your chosen contractor, before beginning your charging station installation. Submit this completed form, and the photos specified, to installdispatch@chargepoint.com. The detailed data sheets, site design guides, and installation guides defining ChargePoint specifications are online at: chargepointuniversity.com.

IMPORTANT: All installations must comply with all applicable codes. ChargePoint provides concrete pedestal guidance in the CPF50 Site Design Guide that is applicable for most sites; however, the size for a given site might be different due to site conditions. Ensure site drawings have been completed and approved by a structural engineer for this site.

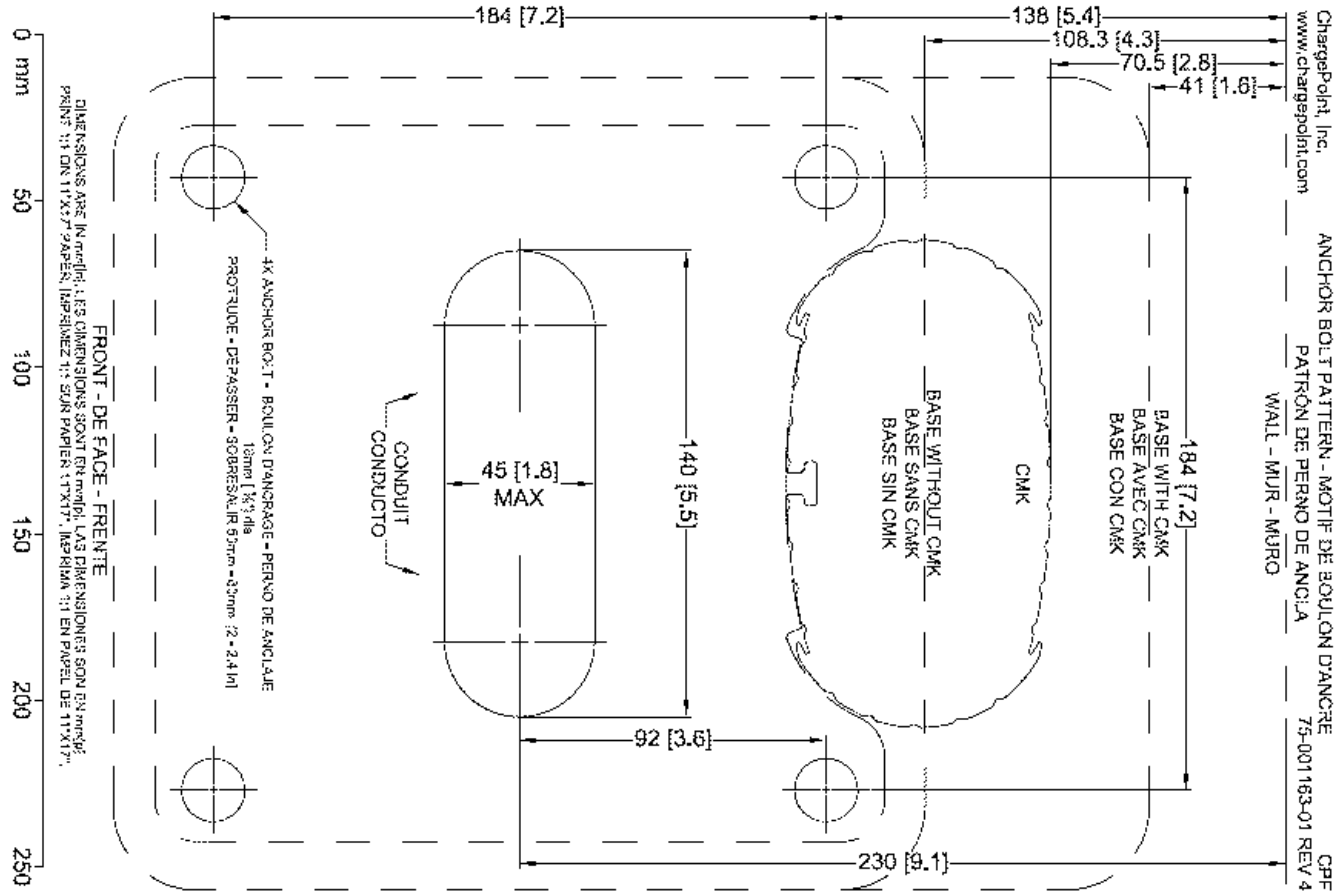
Note: If your station installer arrives to install your station and finds these items incomplete, you will incur a separate re-dispatch charge.

Site Information	Contractor Information
Site Address:	Company Name:
Number of CPF50 stations to be installed:	
# Pedestal:	# Wall:
Number of Gateways to be installed:	
Site Lead Name:	Site Lead Job Title:
Contact Name:	Site Lead Email:
Contact Phone:	Site Lead Phone:
Contact Email:	Date Work Began (mm/dd/yyyy):

Take the following photos of each station throughout the site construction process.

Done	Required Pictures
	1. Concrete pad showing anchor bolts, conduit, and wire for each station -or- Wall station location with flex conduit and wire for each station
	2. Gateway location
	3. Overall space around the concrete pad, showing all service clearances are available
	4. The electrical panel's specification label, to show total panel capacity
	5. The open electrical panel with the dead front panel removed, showing terminations
	6. The open electrical panel with the dead front panel on, showing breaker amperage ratings and labels for CPF50 connections

Done	Civil Work – Pedestal Mount
	1. A new concrete pad was either designed and approved by a structural engineer for this specific site, or is a newly poured pad with: • At least 600 mm (24 in) on each side, including underground. • Follows one of the three recommended pedestal patterns in the Site Design Guide. • Concrete 2500 PSI minimum. • Mounting bolts positioned at least 150 mm (6 in) from the edges of the pad when measured from the center of any bolt. -or- An existing concrete pad with: • A minimum concrete volume of 0.23 m3 (8 ft3). • A minimum concrete depth of least 150 mm (6 in) thick. • Mounting bolts positioned at least 150 mm (6 in) from the edges of the pad when measured from the center of any bolt.
	2. Four anchor bolts extend 60 mm +/- 5 mm (2.3 in +/- ¼ in) above the concrete. Bolts are plumb and secure in concrete or epoxy.
	3. The center of the conduit stub-up (a) is at least 230 mm (9.1 in) from obstructions to the rear.
	4. Conduit extends 300-600 mm (12-24 in) and wire extends 1.5 m (5 ft) above grade.
	5. Walls, fences, or slopes do not prevent water from draining from the pad.



Done	Civil Work – Wall Mount
	1. Rigid or flexible conduit brings wire to the entry point of the station.
	2. 600 mm (24 in) of wire extends beyond the conduit to enter the terminal block.
	3. The wall is smooth, plumb, stable, and can support the charging station in use.

Done	Electrical Work
	1. Electrical infrastructure has been completed in accordance with all applicable codes and ChargePoint specifications.
	2. Each circuit has a dual-pole, non-GFCI circuit breaker. Amperage: _
	3. Each circuit breaker is new or in good working order.
	4. Breakers are correctly labeled in the panel.
	5. Only bonded neutral systems are used.

System Type	Select
120/240 VAC 1Ø bonded neutral	

Done	Electrical Work
	120/208 VAC 3Ø WYE bonded neutral
	120/240 VAC 3Ø Delta center tap-grounded bonded neutral
	6. If ChargePoint Gateway is installed: The Gateway mounting location has been tested for 4G/LTE cellular coverage and shows an RSRP of -85 dBm or better (and an RSRQ of -10 or better).
	7. If ChargePoint Gateway is installed: The station mounting location is within 45 m (150 ft) line-of-sight of its Gateway.

Done	Installation Readiness
	1. All station boxes are delivered, available, and contents are undamaged.
	2. The installation site is clean and safe for installation.

I,_____, hereby certify that the scope of work in this form has been correctly completed.

Signature	Date	Sales Order #

chargepoint.com/support

75-001409-01 r2

SECTION 34 75 13

ACTIVE VEHICLE BARRIER

PART 1 GENERAL

1.1 SCOPE

This specification defines the requirements for the manufacture and installation of Drop Arm Gate Active Vehicle Barrier Systems.

1.2 SYSTEM DESCRIPTION

Supply a total active vehicle barrier system of a "Drop Arm Gate" engineered design, including all required components (crash beam, super posts, I-beams, operator, controls, safety devices, and hardware).

1.3 SUBMITTALS

A. Product data. Provide manufacturer's descriptive literature for standard or customized products used to produce work of this section.

B. Shop Drawings

1. Show locations and details of active vehicle barrier system including each major element, and details of operation, hardware, and accessories.

2. Indicate materials, dimensions, sizes, weights, and finishes of components.

3. Include plans, elevations, sections, foundation drawings and other required installation and operational clearances, and details of anchorage.

4. Installation procedures and instructions.

C. Barrier Certification. Provide documentation that active vehicle barrier system is tested, or confirmed by engineering analysis, and certified.

D. Operation and Maintenance Manuals Submit Operation and Maintenance data in accordance with the following:

1. Operation instructions are to provide the step-by-step procedures required for system startup, operation, and shutdown.

2. Maintenance instructions are to include routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide.

3. Recommended Spare and Replacement Parts List. Provide part number, recommended quantity, brief description, and purchasing source.

1.4 QUALITY ASSURANCE

A. Verification of Compatible Site and Vehicle Dimensions The contractor is to become familiar with all details of the work and verify dimensions in the field as required for coordination.

B. Nameplates Affix the manufacturer's name, contact for service, and catalog or serial number permanently to a plate securely attached to the equipment in a suitable location.

C. Label Label each operator (i.e., motor) indicating that the operator mechanism has been tested for full power of all components.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Elements of the active vehicle barrier systems are to be prefabricated, prefinished, and equipped with devices and accessories to the greatest extent possible.

B. Elements of the active vehicle barrier system are to be packaged, handled, protected, and delivered from the manufacturer's facility to the installation site.

1.6 WARRANTY

The manufacturer is to provide its standard 1 year from date of delivery limited warranty.

PART 2 – PRODUCT

2.1 MANUFACTURERS

A. All elements of the active vehicle barrier system, including associated crash beam, super posts, I-beams, operator, controls, safety devices, and hardware are to be obtained from a single source.

Basis of Design: Innovo Security Works 5410 Homberg Dr. STE 16 Knoxville, TN 37919 Phone: (865) 481-2280

2.2 DROP ARM GATE

A. Configuration

1. Single barriers are to be individually operated.
2. Each barrier is counterbalanced for operation manually or by electric operator.
3. Each barrier is designated as right hand or left hand based on the location of the pivot when viewed from the unprotected side.

B. Foundation

1. Standard Mount
   a. Anchor Depth of 60 inches.
   b. Anchor Dimensions at each end post of 48 in x 36 in (Rectangle) or 48 in diameter (Round).

C. Crash Rating

1. Provide certification based on engineering analysis that the barrier design meets or exceeds:
   a. DOS SD-STD-0201, Rev. A: K4, K8, or K12
   b. ASTM F2656-15: M30, M40, or M50
2. Clear Opening Width.
   a. For an operator gate between 12 feet and 24 feet.
3. Height
   a. All crash beam elements are to be less than 38 inches when in the closed positions.

D. Operation

1. Duty Cycle and Reliability
   a. The barrier system is to be capable of operating a minimum of 120 complete open/close cycles per hour, for at least two hours per day.
   b. Perform without failure of any component necessary for operation of 100,000 cycles.
   c. Capable of 50% duty cycle or continuous open/close cycles without failure due to overheating
   d. The barrier system is to be compatible with the available power sources identified to the manufacturer.
   e. Barrier design is to minimize the level of effort required to maintain the barrier.
2. Normal Operating Speed

   Capable of being opened within 10 seconds and closed within 10 seconds during normal operation.
3. Electric Operator
   a. The operator/motor drive has demonstrated successful operation in the field to move the arresting element of the barrier.
   b. A disconnect system for the barrier drive shall be provided to allow manual or back- up power operation of the barrier in the event of a power outage.
   c. Electric motor is totally enclosed fan cooled. All couplings, motor shafts, gears, and other moving parts are fully guarded in accordance with 19 CFR 1910 Subpart O.
4. Back-up and Manual Operation The barrier system will respond in event of a power failure and emergency operations.
   a. The system will remain in the last commanded position in the event of electrical or mechanical failure. Manual override option is provided.
   b. The barrier is capable of being returned to the secure position, in manual mode, in no more than 5 minutes.

c. Locks. The release mechanism of the operator is not accessible from the threat side of the gate.

E. Environment

1. Heating and cooling system is to be provided to meet site conditions.

2. Operating Temperature Range: -10° to 150° F (-23° to 65° C)

F. Safety Features

1. Barrier to include "warn before operate" systems for both the motorist and the barrier operator.

a. Visual indication when the barrier is in the chosen position.

b. Visual indication when the barrier is in the open position.

c. Audio annunciation when the barrier is about to move.

2. Gate panels and gate operators conform to UL325.

3. Safety Lights Red/green traffic lights for operated gates are to be supplied for each entrance and exit to alert motorists of the barrier position.

4. Safety Annunciator Provide a warning horn for operated gates built into the barrier that produces an audible sound when the barrier is moving.

5. Signage and Markings that conforms to MUTCD signage guidance.

6. Obstruction Detectors A safety feature supplied to prevent an operated barrier from being accidentally closed on an authorized vehicle.

G. Controls

1. Control Panel

Control systems are push button or touch screen capable of a 'soft start' and 'soft stop'. For gates with an emergency fast operations mode, a gate system that disarms all safety components of gate systems when in emergency mode is provided.

2. Control System Fabrication

a. Enclosures to be rated to the appropriate NEMA rating for environment, providing protection from intrusion of foreign objects.

b. Control circuit to contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for barrier operation.

c. Run all device interconnect lines to terminal strips.

d. Disconnect switch to be in a secure location.

e. Provide limit switches for UP/DOWN limits.

H. Materials

1. Steel Shapes, Plates, and Bars ASTM A36; except where otherwise indicated.

2. Pipe and Tubular Products ASTM A53 grade B, or ASTM A500 grade B; except where otherwise indicated.

3. Welding Rods and Bare Electrodes Welding is to be in accordance with AWS D1.1/D1.1M using welding materials recommended by AWS specifications for the metal and alloy being welded in each element of the fabrications.

4. Bolts and Fasteners All bolts and fasteners are to conform to the following:

   a. Use ASTM A320, AISI Type 300-series stainless steel bolts and nuts. Provide stainless steel washers.

   b. Control power wiring requiring compression terminals are to use ring-style terminals. Terminals and compression tools conform to UL 486A-486B.

   c. Roundhead screws and lock washers are used to provide vibration-resistant connections.

   d. Connections between any printed circuit cards and the chassis shall be made with screw connections or other locking means to prevent shock or vibration separation of the card from its chassis.

   e. Commercial bolts and fasteners to be used as needed to accomplish design requirements.

   f. Where within reach of intruders working from attack-side of facilities, including working from inside sallyports, non-removable bolt/nut units (not removable by use of commonly available hand tools) are to be used.

5. Wiring All wiring is to comply with the National Electrical Code and TIA/EIA standards for signal wiring. All control wiring is to be color coded and standardized across the equipment's product line, all cabling, conduits, and hoses are to be clearly labeled at both ends, and at intermediate pull points.

6. Concrete ,000 psi (28 MPa) Portland Type 1 concrete with an industry standard cure time of 28 days. Normal maximum aggregate size shall be 1.5 inches (38 mm). Vibrate concrete to fill all voids.

7. Concrete Inserts Furnish anchorage units to be placed in concrete substrates, of hot-dip galvanized cast-iron/malleable-iron body, design/type as indicated; ASTM A153 zinc coating, ASTM A47 casting.

8. Setting/Anchoring Cement Provide non-shrinking, non-staining, expansion-type cementitious compound intended for the installed design, factory pre-packaged for mixing with water at project for a pourable and trowellable mix, recommended by manufacturer for exterior exposure (ASTM C109 or ASTM C33).

9. Aluminum Extrusions ASTM B221, Alloy 6005 Temper T5 or T6; sizes, shapes, and wall thicknesses as indicated or, where not otherwise indicated, as required to achieve performances indicated.

10. Stainless Steel Tubing ASTM A269, AISI Type 304; sizes and wall thicknesses as indicated or, where not otherwise indicated, as required to achieve performances indicated.

I. Finishes.

1. Powder Coat

J. Optional Accessories.

1. Traffic Sensors
   a. Photoelectric Sensors
   b. Loop Detectors
   c. Closed Position Sensor

K. Indicators
   a. Traffic Lights
   b. LED Lights
   c. Reflective Tape/Paint

2. Heaters & Coolers
   a. Cooling Fans

3. Access Controls
   a. Card Reader
   b. Key Switch
   c. Handheld Remotes
   d. Intercom

4. Remote Hard-Wired Control

PART 3 - EXECUTION

3.1 EXAMINATION, COORDINATION, PREPARATION

A. Manufacturers is to provide the service of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment supplied.

1. Contractor and purchaser will coordinate installation of barrier systems with installation of related work.

2. Contractor will delivery anchorage inserts, sleeves, and other elements to be cast in concrete work.

3.2 INSTALLATION

Installers are to perform installation in accordance with manufacturer's instructions.

3.3 TESTING AND ADJUSTING

Upon completion of construction, perform a field test of each active vehicle barrier. Test operate each active roadway barrier system unit through repeated cycles of operation and demonstrate operation, controls, safety devices, signals, and other features.

3.4 TRAINING

When requested by purchase order, the manufacturer is to provide operator training to include:

1. An overview of the system.
2. Essential controls and displays.
3. Safety precautions.

END OF SECTION 34 75 13

THIS IS PAGE IS INTENTIONALLY LEFT BLANK

APPENDIX A

GEOTECHNICAL ENGINEERING REPORT

PART 1 – GENERAL

The following Geotechnical Engineering Report was prepared by Gifford Engineering on behalf of Ulster County in the development of plans for the Government Operations Center at Paradies Lane. It is incorporated into the Project Manual as a reference document.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION (not used)

GIFFORD ENGINEERING
Geotechnical and Geoenvironmental Services

GEOTECHNICAL ENGINEERING REPORT

ULSTER COUNTY GOVERNMENT CENTER

located at
Paradies Lane
New Paltz, NY 12561

prepared for:
Urbahn Architects PLLC
Attn: Mr. Donald Henry, AIA
306 West 37th St., Ninth Floor
New York, NY 10018

prepared by:
Gifford Engineering
Gregory P Gifford PhD PE
November 2023
File No. 2354

1940 Cascades Dr. Unit 11 Naples, FL 34112 Tel (631)791-3011 giffeng123@gmail.com

GEOTECHNICAL ENGINEERING REPORT

Ulster County Government Center
Paradies Lane
New Paltz, NY 12561

TABLE OF CONTENTS

INTRODUCTION:

This is a report on a subsurface investigation for the proposed Ulster County Government Center to be located at Paradies Lane, New Paltz, NY. Eleven soil borings have been completed by Martin Geo Environmental, located in Belchertown, MA. Eight test pits were excavated and backfilled by Wiacek General Contracting of Olivebridge, NY. Seven infiltration tests and two percolation tests were performed by Gifford Engineering, GE, personnel. A location diagram has been prepared by the surveyor and is included with the boring and test pit logs and test results in the appendix.

The proposed project will include a single story building with driveway and parking lot, stormwater management practices, and necessary infrastructure. The proposed building will have a 16,300 SF footprint. The Test Boring Exhibit plan indicates that finished first floor will be at 382.95 feet, slightly above existing grade. About forty percent of the floor area will be sunken two feet for a utility raceway. There will be a partial basement for mechanical space with a floor at about five feet below finished floor. The walls will be comprised of insulated concrete formwork, ICF, with an eight inch thick reinforced concrete core. Structural loading is not known at this time but expected to be light to moderate.

Site improvements include; a new driveway and parking lot, detention ponds for stormwater management, a septic system, condensate infiltration field, and necessary utilities.

Environmental issues are beyond the scope of this report and should be addressed by a qualified environmental firm.

This report is intended to; 1) present the findings obtained during the investigation, 2) discuss the analysis of the data gathered during the investigation, and 3) make recommendations for the design and construction of the feasible foundation systems as well as the earthwork requirements of the project.

SUBSURFACE INVESTIGATION PROCEDURES:

The borings were advanced with a truck-mounted drill rig with 4.25-inch inside diameter hollow-stem augers. Continuous samples were obtained to 8 feet and at 5 feet increments thereafter by the split-spoon sampling technique in conjunction with standard penetration testing as specified by ASTM D 1586. The number of blows required to advance the sampler two feet, in six-inch increments is recorded on the boring logs. The blow count or N value (blows per foot) is numerically equal to the summation of the middle two. Samples were placed in glass jars and taken to the lab for classification and testing. All cuttings were replaced into the borehole or well after testing.

Four-inch diameter infiltration wells were installed in borings that were advanced in the stormwater management and infiltration field. Seven infiltration tests were performed in accordance with ASTM D 4044 and NYS Stormwater Management Design Manual, Appendix D. After testing the wells were cutoff at the ground surface and filled with cuttings. Two percolation tests were performed at the proposed septic leach field area.

Eight test pits were excavated with a track-mounted mini excavator. Spoils were deposited on a plastic sheet. The geotechnical engineer logged the test pits by measuring down the sidewalls to changes in stratigraphy and water conditions. The excavator bucket was washed with water into the drums before each excavation. The pits were backfilled immediately with spoils and plastic placed in the drums.

Samples were examined at the boring site, sealed in jars and transported to the laboratory. The samples were then visually classified and subjected to appropriate testing.

The water level within the borehole or test pit was measured at various times during the investigation. The depth to the water level is affected by boring or excavation procedures and may require some period of time to equilibrate. The measurements of water level are given on the boring and test pit logs along with the time. All boreholes were filled with infiltration wells or cuttings and test pits with spoils prior to leaving the site. There may be minor settlement of the boreholes or test pits with time, the client must repair this settlement.

The site was also visited by the geotechnical engineer. The borehole locations had been assigned by the site civil engineer, GPI of Albany, NY and were laid out by the surveyor, Control Point of Highland, NY.

LABORATORY WORK:

In addition to the field identification recorded by the drillers, all samples were examined by a geotechnical engineer. The samples were visually classified using the Unified Soil Classification System as specified by ASTM D 2487. The resulting classification symbol and description are indicated on the soil boring logs. Because the visual classification technique is approximate, variations of a few percent of a particular grain size can result in an inaccurate classification. When inaccurate classification would have a large impact on the recommendations reported herein, further testing was performed or is recommended.

Grain size distribution was measured on samples of granular material by washed mechanical techniques as specified by ASTM D 421, D 422, and D 1140 and the results are included in the appendix.

SITE EVALUATION:

The site is an open meadow with grass and brush and is situated to the south and west of a dead end at Paradies Lane in the Town of New Paltz. To the west of the site is the ramp at Exit 18 of the NYS Thruway. To the north, east, and south is vacant land which is also open meadow with occasional trees. There are areas of old asphalt and gravel driveways on the site. There are existing residences situated along the north side of Paradies Lane.

The site is a former apple orchard, and this investigation was guided by the requirements of NYS DEC. CT Male Inc, from Albany, NY monitored air quality during the subsurface investigation

work. GE is not involved with the environmental aspects of the project, other than confirming that the drillers and excavator abide by the requirements that were outlined by CT Male.

The overall change in grade across the site is estimated at 4 to 6 feet sloping generally down to the south. It is understood that there will be wet ponds as part of the stormwater management practice. Adequate design of drainage will be required to handle runoff.

SUBSURFACE EVALUATION:

The boring and test pit logs indicate the specific subsurface conditions at each location. The subsurface conditions can vary significantly between locations. To aid in the evaluation, a general description of the subsoil conditions has been prepared.

The site is underlain with a layer of moist silty topsoil with sod that varied between 0 and 13 inches thick.

The underlying soil is generally comprised of layered sand with varying amounts of silt and gravel or non plastic silt with varying amounts of sand and gravel, with both containing occasional shale rock fragments and rounded cobbles and boulders. This material extends to a depth of 11.5 feet at borings that were advanced that deep. Based on blow counts, the layer is loose to very dense. The mini excavator operator reported the layer to be hard to excavate. The quantity of weathered shale in the soil strata increased with depth being a major component of the soil samples at depths as shallow as 6 to 9 feet and slightly above apparent bedrock. A larger more powerful excavator will be necessary during construction for efficient removal of the soil.

A rock core was advanced with a NWD4 diamond tipped core barrel at a depth of 11.5 to 13 feet at TB-2. The shale bedrock was highly weathered and plugged the core barrel requiring extra circulation water. After consuming 300 gallons of water, his total amount, the driller abandoned the borehole. The shale bedrock is identified as Normanskill Formation – Shale, Argillite, Siltstone on the NYS bedrock mapping. The recovery was only 20 percent and rock quality designation, RQD, was 0 percent resulting in very poor quality rock quality.

At B-3 there was a layer of stone dust at a depth of 5 to 6 feet, which appears to be a manmade layer or from the sampler pulverizing through a shale boulder. Apparently, the ground surface had been reworked at some time in the past.

Based on the testing performed and experience with similar soils, the following design parameters are recommended.

	Unit Weight (pcf)		Friction	Unc. compressive
Material	Moist	Saturated	angle (degrees)	strength (psf)
Sand	115	125	30	---
Silt	110	120	28	---

The results of infiltration tests and percolation tests are appended. The infiltration rate varied

between 0.062 inches per hour to 2.75 inches per hour. The percolation rate varied between 23 minutes per inch to 23.4 minutes per inches.

SUBSURFACE WATER:

The water level measurements taken during the boring investigation are presented on the boring logs. This information is coupled with the estimated degree of saturation of the samples to yield an approximate groundwater level. The depth to groundwater is estimated at a depth of 8 to 11 feet, slightly above or within the shale bedrock layer.

Low permeability soils may result in perched water tables at elevations above the phreatic water surface. The flow rates and quantity of water associated with these water tables will however be small and can be handled with conventional sump and pump system. Seasonal changes in the phreatic water surface and perched water tables are expected due to variable precipitation and runoff.

GEOTECHNICAL CONSIDERATIONS:

This section addresses the geotechnical considerations for the sitework, foundations, and construction procedures which are recommended. Professional services for this investigation are reported and recommendations made in accordance with generally accepted geotechnical engineering practice. An attachment entitled "Important Information about Your Geotechnical Engineering Report" is prepared by the ASFE, Association of Engineering Firms Practicing in the Geosciences should be reviewed and understood. It contains guidelines and outlines the context in which the report should be used.

It should be understood that this report is based on information provided to us and the results of a limited number of borings and/or test pits. The borings or test pits were advanced at specific locations and the overburden soils sampled at limited and specific depths. Conditions are known at these locations to the depths investigated. Conditions may vary at other locations and depths and the differences may impact the conclusions reached and recommendations made. For these reasons it is strongly recommended that Gifford Engineering be retained to provide construction observation and testing services. No warranty expressed or implied is made.

As the design progresses and plans become finalized, GE should be afforded the opportunity to review them and evaluate the effects that changes made during the design may have on the recommendations made herein. There may have been interpretations of the geotechnical report during the design, which may or may not have been accurate. Interpretations should be coupled with correspondence directed to the geotechnical engineer to avoid confusion.

The subsurface conditions revealed during this investigation are adequate to support the proposed construction. Shallow bedrock may require removal or repositioning of deeper utilities or both. It is recommended that the building be supported with a conventional shallow reinforced concrete footing and frost wall system with a slab on grade. The slab elevation will vary at the finished floor,

utility raceway, and mechanical space.

Per Chapter 16 of the New York State Building Code, the site class is D. The following values are provided at the SEAC website, confirmed in Section 1615 of the Code, and are recommended for design. Based on observations made, testing performed, and experience it is concluded that the soils encountered are not liquefiable in the event of an earthquake.

	Short Period (0.2 Sec)	Long Period (1.0 Sec)
Mapped Spectral Response Acceleration	18.5%g	6.5%g
Site Coefficient	1.6	2.4
Maximum Earthquake Spectral Response	29.6%g	15.6%g
Design Earthquake Spectral Response	19.7%g	10.4%g

Sitework:

Prior to foundation placement the following remedial actions are recommended for a quality product. The proposed areas of construction should be stripped of all organic soils and vegetation. Any fill material which was not placed in a controlled manner should be removed from the site. If necessary, the geotechnical engineer should inspect the subgrade. He may require proof rolling of the subgrade with a minimum 10-ton static weight vibratory roller. A heavily loaded truck can be used instead of the roller if approved. The purpose of the proof rolling is to compact the subgrade and locate any soft areas. All soft areas should be removed and replaced with a controlled fill soil. The proof rolling should be witnessed by the geotechnical engineer to evaluate its effectiveness and make recommendations for stabilization.

The following stabilization techniques may be recommended depending upon the site specifics encountered. The first alternative stabilization technique involves a separation or reinforcement geotextile applied to the subgrade and covered with a layer of clean granular fill. The thickness of this layer usually varies between 1 and 3 feet as dictated at the site. The soil should be compacted with a vibratory roller to obtain a stable working mat. It may be necessary to limit vibration during compaction of initial lifts.

A second alternative stabilization technique involves rolling or pounding coarse fill into the upper reaches of a soft spongy subgrade. This coarse material could be brick waste, slag, cobbles, or crushed rock and must be completely embedded to ensure minimal void spaces.

A third alternative stabilization technique involves lowering the groundwater table thereby increasing the stability of the subgrade. The dewatering system may employ temporary or permanent drainage. Tile drains or pump dewatering system may be designed to lower the water table.

Controlled Fill:

A controlled fill can be constructed of granular fill in horizontal lifts not exceeding 9 to 12 inches in

loose thickness. If hand operated compaction equipment is used, lift thickness should be limited to 4 to 6 inches. All lifts should maintain a minimum density of 95 percent modified Proctor density, as specified by ASTM D 1557. A material that meets the requirements of NYSDOT 733-04, or 733-11, or 733-14, (formerly NYSDOT 203-2.02 type B or C or 304-2.02) is recommended. The use of crushed stone NYSDOT 703-02 is an acceptable alternative. Copies of the NYS Standard Specifications for these materials are included in the appendix.

Backfill which has been designed to resist structural loading such as pavements or lateral forces should also meet the compaction requirements above. The requirements of compaction for fill beneath ancillary areas can be lessened to 90 to 92 percent of the cited standard, if desired.

The native soils are not suitable for use as controlled fill. They may be used as fill in areas under green spaces. If approved by the engineer, sand soils may be used as fill under the parking lot at depth of greater than 2 feet below finished grade.

A Quality Assurance, Quality Control, and Special Inspection program should be developed and overseen by the geotechnical engineer of record. Conductance of this quality assurance program is required for proper execution and confirmation that the recommendations contained in this report are followed. Conductance of this program does not relieve the contractor of his responsibility to construct the project in accordance with the plans and specifications, Building Code, and normal industry standards.

Foundation Recommendation:

It is recommended that the proposed construction be supported by spread or continuous footings founded on virgin inorganic soils or a controlled structural fill founding on virgin soils. This controlled fill should extend in all directions horizontally from the edge of footing a dimension at least as great as the undercut dimension.

Care should be exercised during excavation so as not to loosen the subgrade soils. If loosened the soil should be recompacted then proof rolled or removed and replaced with controlled fill, lean concrete, or flowable fill. All footing subgrades should be compacted with a dual drum walk behind vibratory roller or a large plate tamper by Wacker as approved by the engineer.

In lieu of structural fill, a lean concrete or flowable fill with a minimum compressive strength of 2000 psi and 200 psi at 28 days, respectively, may be utilized to raise the subgrade from the virgin soils to the footing base elevation. This fill material should extend in all directions horizontally from the edge of footing a dimension at least as great as twenty percent of the undercut vertical dimension.

Footings can be designed for a maximum net allowable bearing capacity of 1.5 TSF. It is recommended that load bearing continuous footings should be a minimum 2.0 feet wide and isolated pier footings a minimum 3.0 feet wide even if the calculated bearing capacity is less than the allowable 1.5 TSF.

Exterior footings should maintain a minimum 4.0 feet of cover from frost action. Interior footings within heated space should bear at least 2.0 feet below finished grade.

All foundation walls and particularly ones which retain soil should be drained. A tile drain can be placed at the footing level and pitched to daylight or a drainage structure. An acceptable tile drain consists of a 4 inch diameter perforated pipe, surrounded with at least 6 inches of freely draining gravel or washed stone, all wrapped in a drainage geotextile such as Mirafi 160N or approved equal.

A controlled freely draining backfill is recommended. This material should extend a horizontal dimension at least two-thirds the depth of the backfill. The near surface material (upper 18 inches) and grade should allow minimal water infiltration. The properly backfilled foundation wall can be designed to resist a linearly increasing soil pressure (equivalent hydrostatic) equal to the unit weight of the soil times the appropriate coefficient in psf per vertical foot. For resistance to sliding, a coefficient of friction for the interface between native soils and concrete of 0.4 is recommended.

Recommended lateral earth pressure coefficients based on Rankine Theory are presented. Values are ultimate and a factor of safety should be applied, particularly to passive. Full passive resistance is mobilized only after significant movement.

Soil	At Rest	Active	Passive
Sand	0.5	0.33	3.0
Silt	0.53	0.36	2.75

A modulus of subgrade reaction of 200 psi per inch is recommended for use during design of slabs and pavements.

Slab On Grade:

The floor slabs can be designed to rest on virgin inorganic material or on controlled fill resting on these materials. It is recommended that a minimum 6-inch thick layer of freely draining granular material such as NYS DOT 304-2.02, be compacted beneath the slabs. This layer may need to be thicker if construction occurs during wet or cold periods when soils are too wet to reach required compaction or pass a proof roll. This layer will provide drainage, a capillary break, and more uniform bearing. This layer can be designed to drain to the perimeter footing drain. Proof rolling is recommended prior to placement of the granular material.

The use of a vapor barrier should be evaluated by the architect or engineer. If used, it is recommended that a sturdy membrane be used to avoid damage during construction.

The possibility of slab curl should be minimized by appropriate design and construction techniques. Shrinkage and curling of the slab must be controlled. This problem is caused by differential shrinkage of the concrete and may be partially related to soil conditions. It should be addressed by the architect or engineer. The American Concrete Institute presents recommendations for design

and control of floor slabs, which may be useful.

Pavements:

Two pavement sections may be considered for use, based on expected traffic. A heavy section can be used for the entrance driveway, at the access way to the trash container, and other areas of expected heavy traffic. A light section can be used in areas subject to primarily automobile traffic and parking. A modulus of subgrade reaction of 200 psi per inch is recommended for use during design. Recommended pavement sections are provided below.

All materials and construction should conform to NYSDOT Standard Specifications. The subgrade should be proof rolled and witnessed by the geotechnical engineer. The crusher run base course should be compacted to a minimum 95 percent of maximum density per modified Proctor, ASTM D1557. All pavement subgrades should be graded and sloped to perimeter drainage features that ensure all subbase and subgrade layers are fully drained.

The recommended pavement sections are based on experience since expected traffic volumes are not known. These are not designed for support of construction traffic.

Course	NYSDOT Reference	Heavy	Light
Asphalt Top	Section 403.16	1.5”	1.5”
Asphalt Binder	Section 403.13	3.0”	2.0”
Subbase	Section 733-0402 Type 2	12”	10”
Stabilization Fabric	Mirafi 500X or equal	yes	yes

CONSTRUCTION RECOMMENDATIONS:

All excavations of more than 4 feet should be braced or laid back as necessary to prevent sloughing of the sidewalls. Site safety as dictated by regulating organizations such as OSHA and the NYS Department of Labor should be addressed and maintained during construction by the contractors.

Special inspections and reports that are required by Chapter 17 of the NYS Building Code should be performed by a qualified engineer to ensure compliance with the recommendations of this report.

Excavations adjacent to existing foundations or improvements should not extend below them without adequate sheeting, bracing, and/ or underpinning having been installed. This should be designed and stamped by a registered professional engineer.

Temporary dewatering may be necessary in excavation or low areas if groundwater is encountered or during wet periods. Water from precipitation should be removed from excavations immediately rather than allowed to percolate into the subgrade.

Temporary access roadways may be necessary during wet or thaw weather. This may include geofabric and/or coarse fill.

All subgrades and fill material should be kept from freezing during construction. Water, snow, and ice should not be allowed to collect in low areas and excavations.

Some obstacles including boulders or rubble may be encountered in excavations. If necessary, rippers, breaking tools, and drilling and blasting may be required to remove such materials.

All proof rolling operations should be witnessed by a qualified geotechnical engineer. All subgrades should be inspected by a qualified geotechnical engineer.

APPENDIX:

General Qualifications
Location Diagram
Boring and Test Pit Logs
Laboratory Test Results
Infiltration and Percolation Test Results
NYS DOT Standard Specifications Excerpts
SEAC Design Maps Summary Report
General Notes
Unified Soil Classification System
Important Information About Your Geotechnical Engineering Report

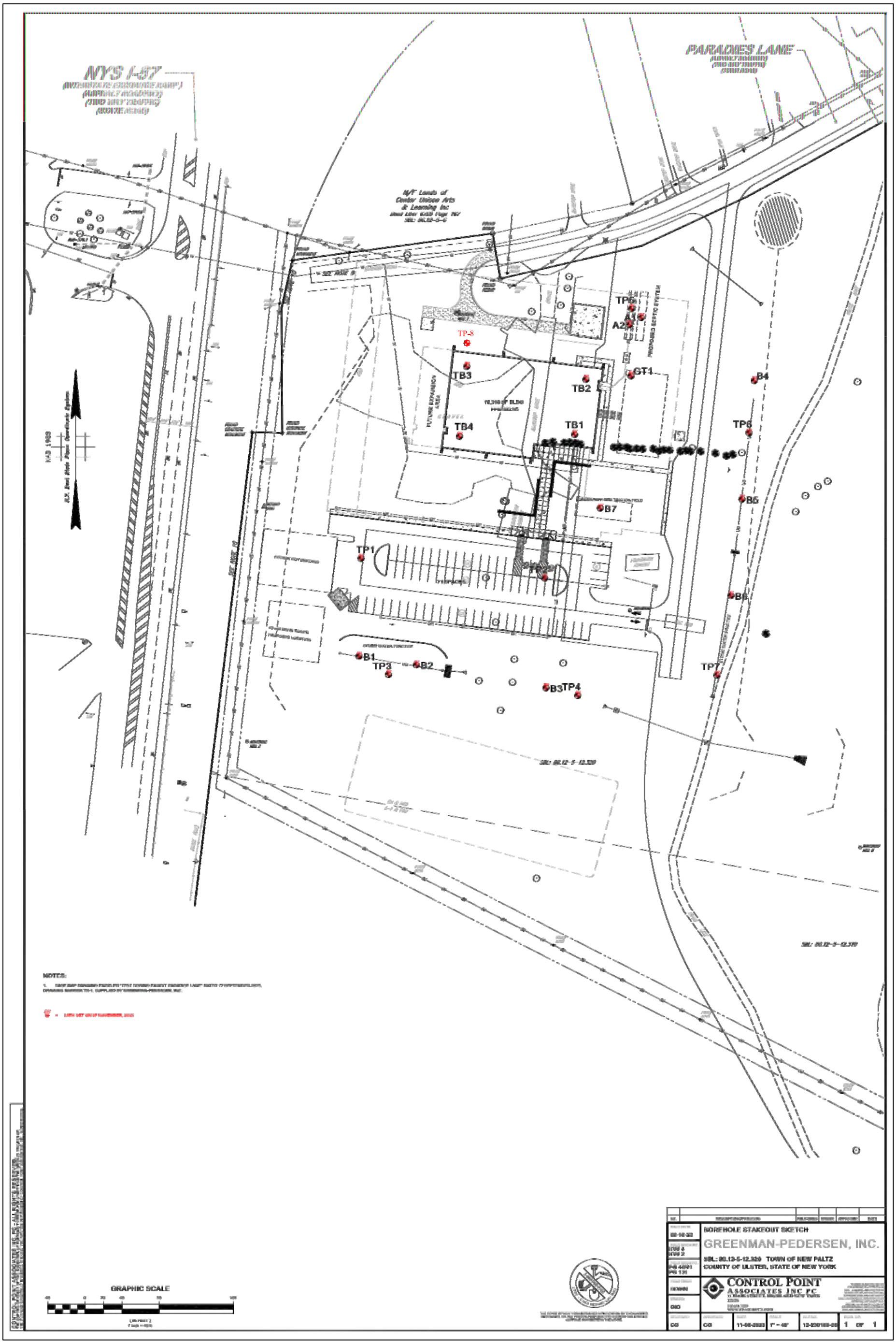
GENERAL QUALIFICATIONS:

This report has been prepared to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope of the project and location described herein, and description of the project represents my understanding of the significant aspects relevant to soil and foundation characteristics. In the event that any changes in the design or location of the proposed facilities, as outlined in this report, are planned, the geotechnical engineer should be informed so the changes can be reviewed and the conclusions of this report modified in writing, if necessary.

It is recommended that all construction operations dealing with earthwork and foundations be inspected by an experienced geotechnical engineer to ensure that the design requirements are fulfilled in the actual construction. If desired, the geotechnical engineer would review the plans and specifications when they have been prepared to ensure that the geotechnical recommendations have been incorporated into the design, plans, and specifications.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and/or test pits performed at the locations indicated on the location diagram and from any other information discussed in the report. This report does not reflect any variations which may occur between these locations. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is a well-known fact that

variations in soil and rock conditions exist on most sites between subsurface investigation locations and also such situations as groundwater conditions vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, it will be necessary for a reevaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of any variations.


NYS I-87
PARADISE LANE
N/F Lands of
Center Unisex Arts
& Learning Inc
SEE ABOVE
TP6
A1
A2
TP-8
TB3
TB2
GT1
B4
TB4
TB1
TP6
B5
B7
TP1
B6
B1
TP3
B2
B3
TP4
TP7
SBL: 80.12-5-12.320
NAD 1983
N.Y. East State Plane Coordinate System
GRAPHIC SCALE
BOREHOLE STAKEOUT SKETCH
GREENMAN-PEDERSEN, INC.
SBL: 80.12-5-12.320 TOWN OF NEW PALTZ
COUNTY OF ULSTER, STATE OF NEW YORK
CONTROL POINT
ASSOCIATES INC PC
11-06-2023
1" = 40'
1 OF 1

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	TB-1									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	1	3			0.8'			3-inches topsoil over light brown, moist, loose,
					3	3				nonplastic Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	5	6			1.3'			Similar except medium dense.
					9	11			4'	
5	S-3	4.0' - 6.0'	15	16			0.9'			Brown, moist, dense, Sand and Gravel, little Silt,
					19	29				SM, with rock fragments.
	S-4	6.0' - 8.0'	28	28			1.8'			Similar except very dense with weathered shale in
					25	31			8'	tip of spoon.
10	S-5	10.0' - 11.6'	16	18			1.3'			Black/grey, wet, weathered shale fragments.
					28	50/0.1'			11.5'	Auger refusal at 11.6 feet.
										End of boring at 11.6 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Water at aboutn 9 to 10 feet, AB.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	TB-2									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	3	3			1.5'			12-inches topsoil over light brown, moist, loose, nonplastic Silt, some Sand, little Gravel, ML, with
					3	3				Similar except medium dense.
	S-2	2.0' - 4.0'	3	7			1.1'			
					6	5			4'	
	S-3	4.0' - 6.0'	21	26			1.0'			Brown, moist, very dense, Sand and Gravel, little
5					26	21				Silt, SM, with rock fragments.
	S-4	6.0' - 7.4'	20	22			1.0'		7.0'	Similar.
					50/0.4'					Black/grey, moist, weathered shale fragments.
10	S-5	10.0' - 10.9'	16	50/0.4'			0.5'			
										Auger refusal at 11.5 feet.
									13'	Set casing at 11.5' and begin coring operations with NWD4 core barrel.
										Run # Depth Recovery RQD
15										1 11.5'-13.0' 20% 0%
										Core barrel plugged with weathered shale fragments. Black/grey Normanskill Formation - Shale, Argillite, Siltstone. Driller notes no water return during coring operation.
20										End of boring at 13.0 feet.
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Water at about 10 to 11 feet, AB.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center							**FILE NO.:** 2354		
BORING NO.:	TB-3								**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC							**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY							**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram							**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram							**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	5	6			1.5'			3-inches topsoil over moist, light brown, loose,
					3	5				nonplastic Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	8	11			0.0'			No recovery.
					11	20			4'	
5	S-3	4.0' - 6.0'	14	13			1.3'			Brown, moist, medium dense, Sand and Gravel,
					14	17				little Silt, SM with rock fragments.
	S-4	6.0' - 8.0'	28	26			1.7'			Similar except very dense.
					25	26				
									9'	Auger refusal at 9.0 feet.
10										End of boring at 9.0 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 14-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	TB-4									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	18	18			0.5'			Brown/grey, moist, medium dense, Sand and
					8	11			2'	Gravel, trace Silt, SP, fill with rock fragments.
	S-2	2.0' - 4.0'	16	12			0.8'			Brown/grey, moist to wet, medium dense, Sand
					9	9				and Silt, little Gravel, SM, native.
	S-3	4.0' - 6.0'	18	17			1.0'			Similar.
5					11	13				
	S-4	6.0' - 8.0'	20	23			1.8'			Similar except dense.
					17	21				
									9'	
10										
	S-5	10.0' - 11.4'	19	36			0.7'			Brown, wet, very dense, Sand and Gravel, little
					50/0.4'				12'	Silt, SM with rock fragments. Auger refusal at
										12.0 feet.
										End of boring at 12.0 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Water at about 9 to 10 feet, AB.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 14-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-1									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	4	4			1.2'			6-inches topsoil over light brown, loose, nonplastic
					3	3			2'	Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	4	9			1.7'			Brown, moist, medium dense, Sand and Gravel,
					10	9				little Silt, SM with rock fragments.
	S-3	4.0' - 6.0'	8	8			1.1'			Similar.
5					10	15			6'	
										End of boring at 6 feet.
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-2									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	2	1			1.6'			6-inches topsoil over light brown, moist, very loose,
					2	4			2'	nonplastic Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	4	8			1.2'			Brown, medium dense, Sand and Gravel, little Silt,
					12	10				SM with rock fragments.
	S-3	4.0' - 6.0'	11	13			1.8'			Similar except dense.
5					17	20			6'	
										End of boring at 6 feet.
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-3									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	2	2			1.1'			3-inches topsoil over light brown, moist, loose,
					3	6			2'	nonplastic Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	6	10			1.5'			Brown, moist, medium dense, Sand and Gravel,
					17	14				little Silt, SM with rock fragments.
	S-3	4.0' - 6.0'	9	11			2.0'			Similar.
5					12	31				
	S-4	6.0' - 8.0'	21	28			1.8'			Similar except grey and very dense.
					31	43				
	S-5	8.0' - 10.0'	27	27			2.0'			Similar except wet.
					20	28			10'	
10										End of boring at 10 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Water at about 8 feet, AB.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-4									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	1	2			1.2'			10-inches topsoil over brown, moist, loose,
					2	4				nonplastic Silt, some Sand, little Gravel, ML.
	S-2	2.0' - 4.0'	4	5			1.3'			Similar except medium dense.
					5	5			4'	
5										End of boring at 4 feet.
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-5									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	3	5			1.6'			13-inches topsoil over brown, moist, medium
					7	6			2'	dense, Sand and Silt, little Gravel, SM.
	S-2	2.0' - 4.0'	16	18			1.0'			Brown, moist, very dense, Sand and Gravel, little
					31	19				Silt, SM, with rock fragments.
	S-3	4.0' - 6.0'	16	15			n/a			Similar except dense.
5					15	20			6'	
										End of boring at 6 feet.
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-6									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	3	3			0.8'			6-inches topsoil over brown, moist, loose, Sand
					5	23				and Gravel, little Silt, SM.
	S-2	2.0' - 4.0'	9	12			1.4'			Similar except medium dense.
					7	5				
	S-3	4.0' - 6.0'	5	8			1.5'			Similar.
5					12	20			6'	
										End of boring at 6.0 feet.
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

PROJECT NAME:	Ulster Co. Government Center								**FILE NO.:** 2354		
BORING NO.:	B-7									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Urban Architects PLLC								**TYPE:**	HSA	SS	
SITE LOCATION:	Paradies Ln, New Paltz, NY								**SIZE I.D.:**	4.25	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	5	7			1.3'			5-inches topsoil over brown, moist, medium dense,
					6	5			2'	Sand and Silt, little Gravel, SM.
										End of boring at 2 feet.
5										
10										
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No apparent water encountered.

DRILLER: Martin Geo-Environmental, LLC **DATE:** 15-Nov-23

APPROVED BY: J. Bazan **DATE:** 22-Nov-23

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
1940 Cascades Dr. Unit 11
Naples, FL 34112
Phone: (631) 791-3011

GIFFORD ENGINEERING
Geotechnical & Geoenvironmental Services

November 29, 2023

TEST PIT LOGS
Ulster County Government Center, File No. 2354
Paradies Lane
New Paltz, NY 12561
Excavated by Wiacek General Contracting with a Bobcat E60 rubber tracked mini excavator on November 21, 2023.
Logged by J. Bazan.

TP – 1
0.0'-0.7' Dark brown, moist, topsoil with sod.
0.7'-2.0' Brown, moist, Sand and Silt, little Gravel, SM. Hydrologic Group C.
2.0'-4.0' Light brown, moist, Silt, some Sand, little Gravel, ML, with occasional rounded Cobbles and Boulders. Hydrologic Group D.
4.0'-7.6' Brown, moist, Sand and Gravel, little Silt, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.
End of test pit at 7.6 feet. No apparent water was encountered.

TP – 2
0.0'-0.6' Dark brown, moist, topsoil with sod.
0.6'-7.6' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.
End of test pit at 7.6 feet. No apparent water was encountered.

TP – 3
0.0'-0.8' Dark brown, moist, topsoil with sod.
0.8'-3.0' Light brown, moist, Silt, some Sand, little Gravel, ML. Hydrologic Group C.
3.0'-7.5' Brown/grey, moist, Sand and Silt, little Gravel, SM, with occasional mottling and rounded Cobbles and Boulders, hard digging. Hydrologic Group D.
7.5'-8.3' Similar except with black/grey weathered shale fragments, very hard digging. Hydrologic Group D.
End of test pit at 8.3 feet. No apparent water was encountered.

TP – 4
0.0'-0.3' Dark brown, moist, topsoil with sod.
0.3'-8.0' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.
End of test pit at 8.0 feet. No apparent water was encountered.

TP – 5
0.0'-1.0' Dark brown, moist, topsoil with sod.
1.0'-5.8' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.
5.8'-7.0' Similar except with black/grey weathered shale fragments, very hard digging. Hydrologic Group D.
End of test pit at 7.0 feet. No apparent water was encountered.

1940 Cascades Dr. Unit 11 Naples, FL 34112 Tel (631)791-3011 giffeng123@gmail.com

TP – 6

0.0'-1.0' Dark brown, moist, topsoil with sod.

1.0'-8.0' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.

8.0'-8.4' Similar except with black/grey weathered shale fragments, very hard digging. Hydrologic Group D.

End of test pit at 8.4 feet. No apparent water was encountered.

TP – 7

0.0'-0.6' Dark brown, moist, topsoil with sod.

0.6'-8.0' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders. Easier digging than previous test pits. Hydrologic Group D.

End of test pit at 8.0 feet. No apparent water was encountered.

TP – 8

0.0'-0.5' Dark brown, moist, topsoil with sod.

0.5'-6.0' Brown, moist, Sand and Silt, little Gravel, SM, with occasional rounded Cobbles and Boulders, hard digging. Hydrologic Group D.

6.0'-9.3' Similar except with black/grey weathered shale fragments, very hard digging. Hydrologic Group D.

End of test pit at 9.3 feet. Water trickling into test pit sidewalls at about 9 feet.

GIFFORD ENGINEERING
Geotechnical & Geoenvironmental Services

LABORATORY TEST RESULTS
Ulster County Government Center
Paradies Lane, New Paltz, NY 12561
File No. 2354

Grain Size Distribution ASTM D 421, D 422 & D 1140

Size/Sieve	Percent Passing by Weight TB-1 2'-4'	Percent Passing by Weight TB-3 4'-6'	Percent Passing by Weight A-1 ~1.5'
No. 4	84.0%	63.2%	81.9%
No. 10	75.3%	51.0%	79.0%
No. 20	65.5%	38.5%	70.2%
No. 40	58.9%	31.6%	66.8%
No. 100	47.2%	24.3%	59.0%
No. 200	38.9%	19.8%	52.6%
Natural Moisture	15.9%	n/a	18.7%

1940 Cascades Dr. Unit 11 Naples, FL 34112 Tel: (631) 791-3011 giffeng123@gmail.com

GIFFORD ENGINEERING
Geotechnical & Geoenvironmental Services

INFILTRATION & PERCOLATION TEST RESULTS
Ulster County Government Center
Paradies Lane, New Paltz, NY 12561
File No. 2354

Slug permeability testing was performed in infiltration wells in accordance with ASTM D 4044 on November 15, 2023. The test locations are shown on the attached location diagram. A truck mounted drill rill was used to advance 4.25 inch inside diameter auger borings and a split spoon sampler to determine soil conditions and depth to groundwater. Offset borings were augered to depths provided by GPI, the client. PVC pipes, 4-inches in diameter, were placed in the offset borings at the depths provided, about 2 to 9.5 feet below the ground surface. The annular space between the PVC wells and boring sidewalls were sealed off near the bottom with bentonite chips and backfilled with spoils. The test procedure involves adding water to the wells and recording time as the water level drops 2 feet. A 5-gallon bucket was emptied into the pipes and the tests were started. Each test was run for one hour or the time required for the water level in the well to fall 2 feet. A minimum of four tests were performed in each well. The infiltration rates (inches per hour) reported below are for the last test at each location.

The test allows for calculation of coefficient of permeability or hydraulic conductivity (cm per sec), the results are given below. Permeability calculations are from equations in Table 2.6 in "Seepage, Drainage and Flow Nets" by Harry R. Cedergren, (1967), John Wiley & Sons.

$$ShapeFactor, F = \frac{11R}{2} \qquad Permeability, k = \frac{\Pi R^2}{Ft}\ln(\frac{h_1}{h_2}) = \frac{2\Pi R}{11(t_2 - t_1)}\ln(\frac{h_1}{h_2})$$

Slug Permeability Tests were performed on October 18, 2018.

Well No.	Depth to Bottom of Well*	Depth to Ground Water**	Coeff. of Permeability (cm/sec)	Infiltration Rate (in/hour)
B-1	4.92' +/-	10.0' +/-	1.39×10^{-6}	1.75
B-2	5.42' +/-	10.0' +/-	3.96×10^{-7}	0.5
B-3	9.17' +/-	10.0' +/-	4.94×10^{-8}	0.0625
B-4	3.75' +/-	10.0' +/-	2.00×10^{-6}	2.5
B-5	4.58' +/-	10.0' +/-	2.20×10^{-6}	2.75
B-6	5.42' +/-	10.0' +/-	3.96×10^{-7}	0.5
B-7	2.0' +/-	10.0' +/-	7.93×10^{-7}	1.0

* Measured depth of well from ground surface.
** Ground water measured in separate sounding next to test boring.

Percolation tests were performed at the referenced site on November 28, 2023. The test locations are shown on the attached location diagram.

A hand shovel was used to dig two, 12-inch diameter holes 24 inches deep. Water was added to the holes and timed as the water level dropped from 6 inches deep to 5 inches deep as per the NYSDOH guidelines. This process was repeated until a consistent time was measured for the 1-inch drop. The following are the test results in minutes per inch:

A-1: 23 min/1 inch
A-2: 23 min 26 sec/1 inch

NYS DOT Standard Specifications Excerpts

733-04 Subbase Course

733-0401 – Subbase Course, Type 1
733-0402 – Subbase Course, Type 2
733-0403 – Subbase Course, Type 3
733-0404 – Subbase Course, Type 4

Subbase course types are based on the gradation of the material as outlined in Table 733-04A Subbase Gradation.

Sampling. Perform material test and assurance methods pertaining to subbase requirements in conformance with the procedures contained in the Geotechnical Control Procedure (GCP-17) "Procedure for the Control and Quality Assurance of Granular Materials".

General. Provide suitable material conforming to the requirements of Section 203 Excavation and Embankment and to the requirements contained herein.

Material Requirements.

A. Composition. For Types 1, 3 and 4 furnish materials consisting of Stone, Sand, Gravel, and/or recycled material approved for use in accordance with 733-19 Recycled Materials Approved for Use as Earthwork Material (and is identified in the Approved List), or blends of these materials.

For Type 2, furnish materials consisting of Stone, or recycled material approved for use in accordance with 733-19 Recycled Materials Approved for Use as Earthwork Material (and is identified in the Approved List) which is the product of crushing or blasting ledge rock, or a blend of approved recycled material.

B. Stockpile. Stockpile subbase material in accordance with the Geotechnical Control Procedure (GCP-17) "Procedure for the Control and Quality Assurance of Granular Materials" except as noted herein.

1. Type 3. Material furnished under Type 3 will not be required to be stockpiled unless it contains recycled material approved for use in accordance with 733-19 Recycled Materials Approved for Use as Earthwork Material and as identified in the Approved List.

2. Recycled Materials. Stockpiling of the Reclaimed Asphalt Pavement (RAP) for subbase course is not required.

C. Gradation. Provide subbase material having a gradation in accordance with TABLE 733-04A Subbase Gradation.

TABLE 733-04A SUBBASE GRADATION

Sieve Size Designation	Percentage Passing by Weight			
	Type 1	Type 2	Type 3	Type 4
4 in.	-	-	100	-
3 in.	100	-	-	-
2 in.	90-100	100	-	100
¼ in.	30-65	25-60	30-75	30-65
No 40	5-40	5-40	5-40	5-40
No. 200	0-10	0-10	0-10	0-10

D. Plasticity Index. Provide material having a Plasticity Index based on the material passing the No. 40 mesh sieve equal to or less than 5.0.

E. Durability.

1. Types 1, 2 and 4. Provide material for Types 1, 2 and 4 having a Magnesium Sulfate Soundness loss less than 20% after four (4) cycles in accordance with the Geotechnical Test Method (GTM-21) "Test Method for Magnesium Sulfate Soundness of Granular Materials", unless material meeting the requirements of Recycled Materials is used.

2. Type 3. Provide material for Type 3 having a Magnesium Sulfate Soundness loss less than 30% after four (4) cycles in accordance with the Geotechnical Test Method (GTM-21) "Test Method for Magnesium Sulfate Soundness of Granular Materials".

F. Elongated Particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than thee (3) times its least dimension. Provide material consisting of particles where not more than 30%, by weight, of the particles retains on a ½ in. sieves is flat or elongated. When the State elects to test for this requirement, material with a percentage greater than 30 will be rejected. Acceptance for this requirement will normally be based on a visual inspection by the Regional Geotechnical Engineer.

733-11 Select Granular Fill

Material Requirements.

A. Source. Provide backfill material from a source evaluated in accordance with the Geotechnical Control Procedure (GCP-17) "Procedure for the Control and Quality Assurance of Granular Materials".

B. Composition. Provide suitable, well graded material consisting of rock, stone, cobbles or gravel, or recycled material approved for use in accordance with 733-19 Recycled Materials Approved for Use as Earthwork Material (and is identified in the Approved List) with the exception of when select granular fill is used as backfill for aluminum pipe. For aluminum pipe applications, the select granular fill shall be free of portland cement of portland cement concrete.

C. Gradation. Provide select granular fill material conforming to the following requirements:

1. Typical. Except when used as backfill material for aluminum pipe with Type IR corrugations (Spiral Rib Pipe), the material shall have a gradation in accordance with TABLE 733-11A Select Granular Fill Gradation.

TABLE 733-11A SELECT GRANULAR FILL GRADATION

Sieve Size Designation	Percentage Passing by Weight
4 in.	100
No. 40	0-70
No. 200	0-15

2. Exception. When used as backfill for Corrugated Aluminum Pipe, Type 1R (Spiral Rib Pipe) 100% of the material shall also pass the 2 in. sieve.

D. Provide material for Type 3 having a Magnesium Sulfate Soundness loss less than 30% after four (4) cycles in accordance with the Geotechnical Test Method (GTM-21) "Test Method for Magnesium Sulfate Soundness of Granular Materials".

733-14 Select Structural Fill

Material Requirements. The material requirements contained in 733-11 Select Granular Fill shall apply.

703-02 Coarse Aggregates (Crushed Stone) and AASHTO #57.

Coarse aggregates shall consist of crushed stone, crushed gravel, screened gravel or crushed air-cooled blasé furnace slag, conforming to the requirements of these specifications. All coarse aggregates shall meet the requirements for these materials as outline in Tables 703-2, "Physical Requirements (Testing)" and 703-3, "Physical Requirements (Deleterious Materials)", and 703-4, "Sizes of Stone, Gravel and Slag."

A coarse aggregate meeting the requirements of Tables 703-2, and 703-3 shall be accepted unless service records indicate that it is unsound of that the material is otherwise determined to be unsatisfactory by the Director, Materials Bureau. Coarse aggregate not meeting the requirements of these tables may be further evaluated by additional testing, petrographic examination, geological studies, review of Plant Flow Information and performance history. If the results of the evaluation

indicated that the aggregate should perform satisfactorily, the source may be accepted by the Director, Materials Bureau.

1. Crushed Stone. Crushed stone shall be Material Designation 703-0201 and shall consist of clean, durable, sharp-angled fragments of rock of uniform quality. The crushed stone used as coarse aggregate for all items shall be obtained from sources conforming to the requirements of the Department as to sampling, testing methods, Quarry Reports and any other required procedures.

2. Crushed Gravel. Crushed Gravel shall be Material Designation 703-0202 and shall consist of clean, durable, sharp-angled fragments of gravel free from coatings. A crushed particle shall be defined as one in which the total area of face fractured exceeds 25% of the maximum cross-section area of the particle. When two fractured faces are designated, the total area of each fractured face shall exceed 25% of the maximum cross-sectional area of the particle.

Table 703-2
Physical Requirements (Testing)

Material Designation	Crushed Stone 703-0201	Crushed Gravel 70-0202	Screened Gravel 703-0203	Crushed Slag 703-0204
Magnesium Sulfate Test (NYSDOT 207) (2) Max. percent loss by weight at 10 cycles	18	18	18	6
Freezing and Thawing Test (NYSDOT 208) (3) Max. percent loss by weight at 25 cycles	10	10	10	-
Los Angeles Abrasion Test (AASHTO T96) Max. percent loss by weight (Grading A or B)	35 (4) 45 (5)	35	35	40
Flat and Elongated Pieces (ASTM C125) Max. percent by weight				
Flat or Elongated to the Degree of 3:1	30	30	-	-
Flat or Elongated to the Degree of 5:1	10	10	-	-
Crushed Particles Minimum percent by weight in any primary size				
No. 2 size and larger (1 fractured faces)	-	75 (6)	-	-
Smaller than the No. 2 size (2 fractured faces)	-	85 (6)	-	-
Minimum dry rodded weight (NYSDOT 213) lbs./cu. ft.	-	-	-	70

(1) To determine its conformance to specification limits, processed coarse aggregate may be tested at any point after completion of processing. The manufactured material shall be separated into the primary sizes indicated in Table 703-5, “Primary Sizes.” Each size fraction shall conform to the requirements of 703-02 Coarse Aggregate.

(2) Loss applies to No. 2 size fraction for stone and gravel. Loss applies to 2 1/2” – 3/16” material when slag is tested according to ASTM C88.

(3) The freeze-thaw requirement applies only to aggregate used in Portland cement concrete. The loss applies to the No. 3 size fraction, but the Department reserves the option to test the

No. 2 size fraction.

(4) Loss applies to limestone, Dolostone, sandstone and trap rock.

(5) Loss applies to marble, granitics, and other crystalline materials.

(6) Crushed particles for each primary size smaller than the No. 2 size shall have a minimum of 85% by weight of the particles with at least two fractured faces.
Crushed particles for each primary size equivalent to or larger than the No. 2 size shall have a minimum of 75% of the particles by weight with at least one fractured face.
Gravel which has not been processed through a crushing operation shall not be combined with crushed gravel.

Table 703-3
Physical Requirements
Deleterious Materials (3)

	Maximum percent by weight in any primary size (2)			
Material Designation	Crushed Stone 703-0201	Crushed Gravel 70-0202	Screened Gravel 703-0203	Crushed Slag 703-0204
Shale or other light materials (1)	1.0	1.0	1.0	-
Coal or Lignite	1.0	1.0	1.0	-
Clay Balls or Lumps	0.2	0.2	0.2	-
Metallic Ore	-	-	-	3.0
Glassy Pieces	-	-	-	5.0
Other Deleterious Substances	1.0	1.0	1.0	-

(1) This requirement may not apply if service records and/or abrasion and soundness tests indicate to the Department that the aggregate is satisfactory.

(2) Coarse aggregate containing more than the above specified amounts of deleterious substances, to be accepted by the Department, shall be washed or otherwise processed until such specifications are satisfied.

(3) Coarse aggregate shall not contain substances which, when mixed in Portland Cement concrete, produce an unacceptable level of chloric ions in the final product.

A naturally fractured face shall be acceptable provided that the sharp angular portion of the particle consists of sound material and is free from unsound or injurious coatings.

The crushed gravel used as coarse aggregate for all items shall be obtained from sources conforming to the requirements of the Department as to sampling, testing methods, Geologic Source Reports, Plant Flow Information, and any other required procedures.

3. Screened Gravel. Screened gravel shall be Material Designation 703-0203 and shall consist of durable gravel free from coatings.

Screened gravel may consist of all uncrushed particles and shall be obtained from sources conforming to the requirements for Crushed gravel.

4. Crushed Slag. Crushed slag particles shall be Material Designation 703-0204 and shall consist of hard, durable, angular fragments which are reasonably uniform in density and quality; free from injurious amounts of Sulphur; and reasonably free from thin, elongated pieces, dirt of other objectionable matter. All crushed slag must be obtained from approved sources conforming to the

requirements of the Department as to sampling, test methods and any other required procedures.
Gradation. The sizes of all stone, gravel or slag used under these specifications shall conform to the gradation requirements for the various sizes tabulated in Table 703-4.

Table 703-4 (1)
SIZES OF STONE, GRAVEL AND SLAG

	Screen Sizes										
Size Designation	4"	3"	2 1/2"	2"	1 1/2"	1"	1/2"	1/4"	1/8"	No. 80 Sieve	No. 200 (3) Sieve
Screenings(2)	-	-	-	-	-	-	100	90-100	-	-	0-1.0
1B	-	-	-	-	-	-	-	100	90-100	0-15	0-1.0
1A	-	-	-	-	-	-	100	90-100	0-15	-	0-1.0
1ST	-	-	-	-	-	-	100	0-15	-	-	0-1.0
1	-	-	-	-	-	100	90-100	0-15	-	-	0-1.0
2	-	-	-	-	100	90-100	0-15	-	-	-	0-1.0
3A	-	-	-	100	90-100	0-15	-	-	-	-	0-0.7
3	-	-	100	90-100	35-70	0-15	-	-	-	-	0-0.7
4A	-	100	90-100	-	0-20	-	-	-	-	-	0-0.7
4	100	90-100	-	0-15	-	-	-	-	-	-	0-0.7
5	90-100	0-15	-	-	-	-	-	-	-	-	0-0.7
#57	-	-	-	-	100	95-100	25-60	0-10	0-5	-	0-2

(1) Percentage by weight passing with the following square openings.
(2) Screenings shall include all of the fine material passing a 1/4" screen.
(3) The minus 200 material requirements applies only to aggregate for use in Portland cement concrete surface treatments, cold mix bituminous pavements, and underlain filter material. The test (NYSDOT 201) will be performed on the entire sample of the designated size aggregate. Primary size does not apply in the determination of the minus 200 material.

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Ulster Co. Government Center, File No.: 2354

Paradies Ln, New Paltz, NY 12561, USA

Latitude, Longitude: 41.7398426, -74.0598609

Date	11/29/2023, 3:19:19 PM
Design Code Reference Document	IBC-2015
Risk Category	IV
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.185	MCE_R ground motion. (for 0.2 second period)
S_1	0.065	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.296	Site-modified spectral acceleration value
S_{M1}	0.156	Site-modified spectral acceleration value
S_{DS}	0.197	Numeric seismic design value at 0.2 second SA
S_{D1}	0.104	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	C	Seismic design category
F_a	1.6	Site amplification factor at 0.2 second
F_v	2.4	Site amplification factor at 1.0 second
PGA	0.094	MCE_G peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.15	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.185	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.206	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.065	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.072	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.6	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.094	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.896	Mapped value of the risk coefficient at short periods
C_{R1}	0.898	Mapped value of the risk coefficient at a period of 1 s
C_V		Vertical coefficient

DISCLAIMER

While the information presented on this website is believed to be correct, SEAOC /OSHPD and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in this web application should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. SEAOC / OSHPD do not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the seismic data provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the search results of this website.

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS*

SS	Split Spoon – 1 3/8" I.D., 2" O.D.
ST	Shelby Tube – 3" O.D.
OS	Osterberg Sampler – 3" Shelby Tube
DB	Diamond Core – NQ, BX, HQ
WOR	Weight of Rod
WOH	Weight of Hammer
RD	Rotary Drill Bit
DC	Driven Casing, Washed
WB	Washed Boring
HSA	Hollow Stem Auger
OH	Open Hole
MT	Macro Core MC5 Soil Sampling System

WATER LEVEL SYMBOLS**

WL	Water Level
WCI	Wet Cave In
DCI	Dry Cave In
WS	While Sampling
WD	While Drilling
BCR	Before Casing Removal
ACR	After Casing Removal
AB	After Boring

***Standard "N" Penetration:** Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon, except where noted.

**** Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence on ground water elevations must be sought.

CLASSIFICATION

COHESIONLESS SOILS

"Trace"	1% - 10%
"Little"	10% - 20%
"Some	20% - 35%
"And"	35% - 50%
Very Loose	0 – 3 Blows
Loose	4 – 9 Blows
Medium Dense	10 – 29 Blows
Dense	30 – 50 Blows
Very Dense	> 50 Blows

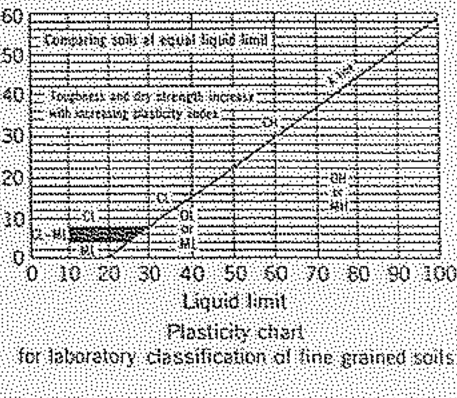
COHESIVE SOILS*

	N (Blows/ft)	$\mathbf{Q_c}$ (TSF)
Very Soft	0 – 1	0.00 – 0.25
Soft	2 – 4	0.25 – 0.49
Medium	5 – 8	0.50 – 0.99
Stiff	9 – 15	1.00 – 1.99
Very Stiff	16 – 30	2.00 – 3.99
Hard	> 30	≥ 4.00

* If Clay content is sufficient so that clay dominates soil properties, then Clay becomes the principal noun with the other major soil constituent as modifier: i.e., Silty Clay. Other minor soil constituents may be added according to classification breakdown for cohesionless soils: i.e., Silty Clay, little Sand, trace Gravel. Additional explanation available upon request. See attached Unified Soil Classification sheet.

Table 3.5 Unified Soil Classification

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)				Group Symbols	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils: More than half of material is *larger* than No. 200 sieve size[b]	Gravels: More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the $\frac{1}{4}$ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand, gravelly*; about 20% hard, angular gravel particles $\frac{1}{2}$-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW*
			Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits above "A" line, with *PI* greater than 7
			Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW*
			Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)	*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limit below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits below "A" line with *PI* greater than 7
			Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils: More than half of material is *smaller* than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size						Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5%: *GW, GP, SW, SP* More than 12%: *GM, GC, SM, SC* 5% to 12%: *Borderline* cases requiring use of dual symbols
	Silts and clays: liquid limit less than 50	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	
	Silts and clays: liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart for laboratory classification of fine grained soils

From Wagner, 1957.

[a] *Boundary classifications.* Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW–GC*, well graded gravel-sand mixture with clay binder.

[b] All sieve sizes on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately $\frac{1}{64}$ in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the *CH* group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eight inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the *A*-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B

GEOTHERMAL CONDUCTIVITY TEST RESULTS

PART 1 – GENERAL

The following Thermal Conductivity Report was prepared by GRTI on behalf of Claverack Pump Service LLC for the benefit of Ulster County in the development of plans for the Government Operations Center at Paradies Lane.

The report is incorporated into the Project Manual as a reference document.

The one test well drilled for the conductivity testing will be made part of the geothermal well field for the new construction project.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION (not used)

Formation Thermal Conductivity
Test & Data Analysis

Test location **Ulster County Government**
New Paltz, NY

Test Date December 14-16, 2023

Analysis For Claverack Pump Service, LLC
8960 State Rt 22
Hillsdale, NY 12529
Phone: (518) 828-6267

Test Performed By Claverack Pump Service, LLC

WESTERN OFFICE
PO Box 256, Elkton, SD 57026
P: 866-991-4784 F: 605-542-6099

EASTERN OFFICE
6 William Warren Dr, Asheville, NC 28806
P: 828-275-7113

EXECUTIVE SUMMARY

A formation thermal conductivity test was performed on the geothermal test bore with GPS coordinates of N 41.7394234° (latitude), W 74.0597669° (longitude) at 9 Paradies Lane in New Paltz, New York. The vertical bore was completed on December 4, 2023 by Claverack Pump Service, LLC. Geothermal Resource Technologies' (GRTI) test unit was attached to the vertical bore on the morning of December 14, 2023.

This report provides an overview of the test procedures and analysis process, along with plots of the loop temperature and input heat rate data. The collected data was analyzed using the "line source" method and the following average formation thermal conductivity was determined.

Formation Thermal Conductivity = 1.75 Btu/hr-ft-°F

Due to the necessity of a thermal diffusivity value in the design calculation process, an estimate of the average thermal diffusivity was made for the encountered formation.

Formation Thermal Diffusivity ≈ 1.31 ft^2/day

The undisturbed formation temperature for the tested bore was established from the initial loop temperature data collected at startup.

Undisturbed Formation Temperature ≈ 51.7-53.5°F

The formation thermal properties determined by this test do not directly translate into a loop length requirement (i.e. feet of bore per ton). These parameters, along with many others, are inputs to commercially available loop-field design software to determine the required loop length. Additional questions concerning the use of these results are discussed in the frequently asked question (FAQ) section at www.grti.com.

Test Procedures

The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) has published recommended procedures for performing formation thermal conductivity tests in the ASHRAE HVAC Applications Handbook, Geothermal Energy Chapter. The International Ground Source Heat Pump Association (IGSHPA) also lists test procedures in their Design and Installation Standards. GRTI's test procedures meet or exceed those recommended by ASHRAE and IGSHPA, with the specific procedures described below:

Grouting Procedure for Test Loops – To ensure against bridging and voids, it is recommended that the bore annulus is uniformly grouted from the bottom to the top via tremie pipe.

Time Between Loop Installation and Testing – A minimum delay of five days between loop installation and test startup is recommended for bores that are air drilled, and a minimum waiting period of two days for mud rotary drilling.

Undisturbed Formation Temperature Measurement – The undisturbed formation temperature should be determined by recording the loop temperature as the water returns from the u-bend at test startup.

Required Test Duration – A minimum test duration of 36 hours is recommended, with a preference toward 48 hours**.**

Data Acquisition Frequency - Test data is recorded at five minute intervals.

Equipment Calibration/Accuracy – Transducers and datalogger are calibrated per manufacturer recommendations. Manufacturer stated accuracy of power transducers is less than ±2%. Temperature sensor accuracy is periodically checked via ice water bath.

Power Quality – The standard deviation of the power should be less than or equal to 1.5% of the average power, with maximum power variation of less than or equal to 10% of the average power.

Input Heat Rate – The heat flux rate should be 51 Btu/hr (15 W) to 85 Btu/hr (25 W) per foot of installed bore depth to best simulate the expected peak loads on the u-bend.

Insulation – GRTI's equipment has 1 inch of foam insulation on the FTC unit and 1/2 inch of insulation on the hose kit connection. An additional 2 inches of insulation is provided for both the FTC unit and loop connections by insulating blankets.

Retesting in the Event of Failure – In the event that a test fails prematurely, a retest may not be performed until the bore temperature is within 0.5°F of the original undisturbed formation temperature or until a period of 14 days has elapsed.

Data Analysis

Geothermal Resource Technologies, Inc. (GRTI) uses the "line source" method of data analysis to determine the thermal conductivity of the formation. The line source method assumes an infinitely thin line source of heat in a continuous medium. A plot of the late-time temperature rise of the line source temperature versus the natural log of elapsed time will follow a linear trend. The linear slope is inversely proportional to the thermal conductivity of the medium. Applying the line source method to a u-bend grouted in a borehole, the test must be run long enough to allow the finite dimensions of the u-bend pipes and the grout to become insignificant. Experience has shown that approximately ten hours is required to allow the error of early test times and the effects of finite borehole dimensions to become insignificant.

In the analysis of the data from the formation thermal conductivity test, the average temperature of the water entering and exiting the u-bend heat exchanger was plotted versus the natural log of elapsed testing time. Using the Method of Least Squares, linear coefficients were calculated that produce a line that fit the data. This procedure was repeated for various time intervals to ensure that variations in the power or other effects did not produce inaccurate results.

The calculated results are based on test bore information submitted by the driller/testing agency. GRTI is not responsible for inaccuracies in the results due to erroneous bore information. All data analysis is performed by personnel that have an engineering degree from an accredited university with a background in heat transfer and experience with line source theory. The test results apply specifically to the tested bore. Additional bores at the site may have significantly different results depending upon variations in geology and hydrology.

Through the analysis process, the collected raw data is converted to spreadsheet format (Microsoft Excel®) for final analysis. If desired, please contact GRTI and a copy of the data will be made available in either a hard copy or electronic format.

Contact: Chad Martin
Regional Managing Engineer
Asheville, NC
(828) 275-7113
cmartin@grti.com

Test Bore Details
(As Provided by Claverack Pump Service, LLC)

Site Name	Ulster County Government, 9 Paradies Lane
Location	New Paltz, NY
Driller	Claverack Pump Service, LLC
Installed Date	December 4, 2023
Borehole Diameter	8-3/4 inches, 0-20 ft 6 inches, 20-485 ft
Casing	Permanent steel 6 inch casing to 20 ft
U-Bend Size	1-1/4 inch DR11 HDPE
U-Bend Depth Below Grade	485 ft
Grout Type	GeoPro TG Select/PowerTEC
Grout Mixture	100 lb TG Select, 32 lb PowerTEC, 33 gal water
Grouted Portion	Entire bore

Drill Log

Formation Description	Depth (ft)
Topsoil	0'-1'
Till	1'-13'
Shale	13'-20'
Shale/quartz	20'-90'
Fracture	90'-91'
Shale/quartz	91'-485'

Note: Bore produced 1 gpm water at 90 ft.

THERMAL CONDUCTIVITY TEST DATA

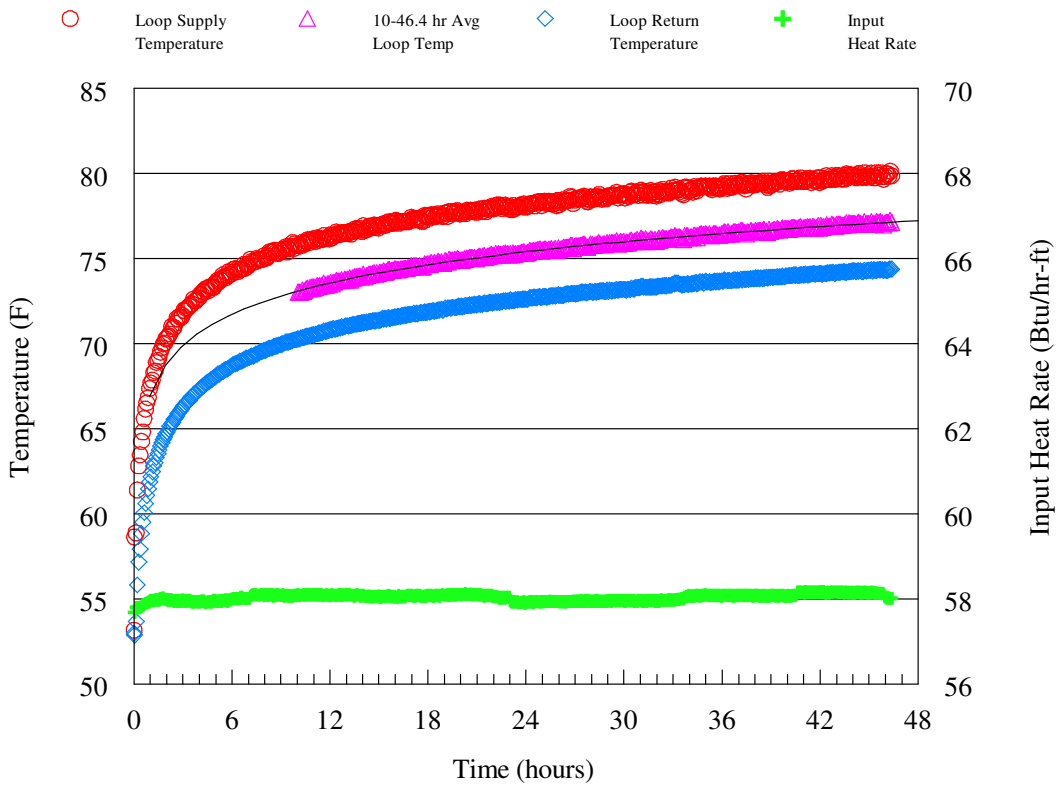


FIG. 1: TEMPERATURE & HEAT RATE DATA VS TIME

Figure 1 above shows the loop temperature and heat input rate data versus the elapsed time of the test. The temperature of the fluid in the U-bend is plotted on the left axis, while the amount of heat supplied to the fluid is plotted on the right axis on a per foot of bore basis. In the test statistics below, calculations on the power data were performed over the analysis time period listed in the Line Source Data Analysis section.

SUMMARY TEST STATISTICS

Test Date	December 14-16, 2023
Undisturbed Formation Temperature	Approx. 51.7-53.5°F
Duration	46.4 hr
Average Voltage	241.8 V
Average Heat Input Rate	28,154 Btu/hr (8,249 W)
Avg Heat Input Rate per Foot of Bore	58.1 Btu/hr-ft (17.0 W/ft)
Circulator Flow Rate	10.2 gpm
Standard Deviation of Power	0.12%
Maximum Variation in Power	0.26%

LINE SOURCE DATA ANALYSIS

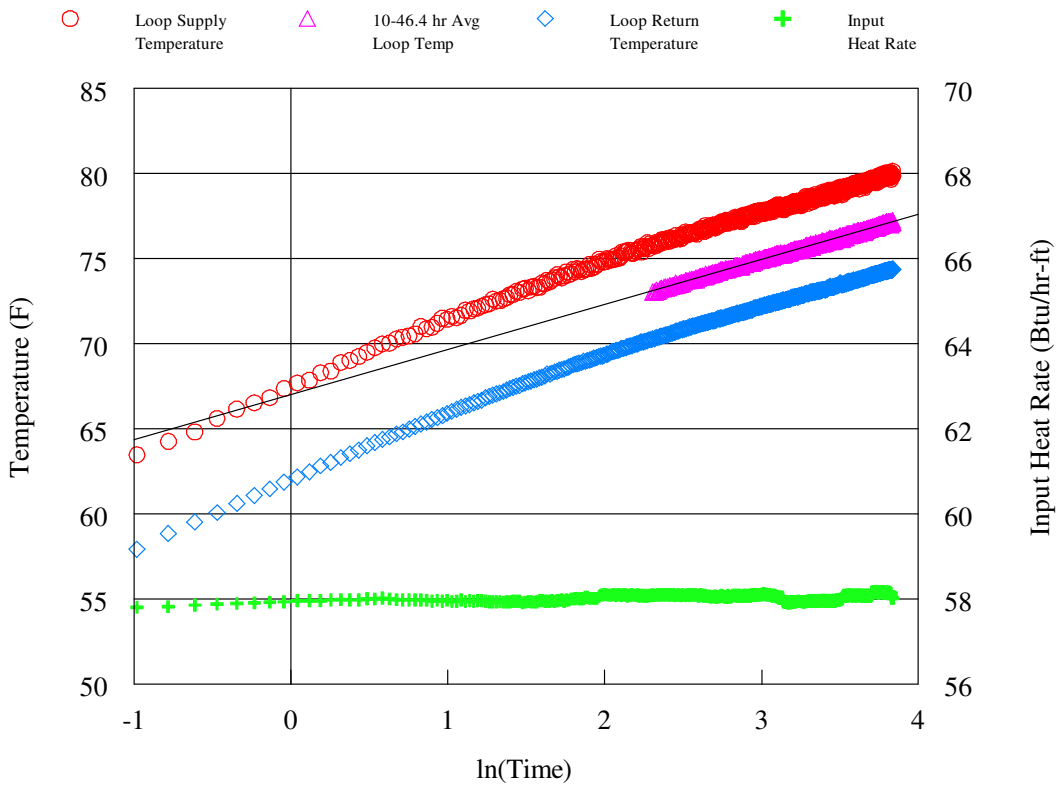


FIG. 2: TEMPERATURE & HEAT RATE VS NATURAL LOG OF TIME

The loop temperature and input heat rate data versus the natural log of elapsed time are shown above in Figure 2. The temperature versus time data was analyzed using the line source method (see page 3) in conformity with ASHRAE and IGSHPA guidelines. A linear curve fit was applied to the loop temperature data between 10 and 46.4 hours. The slope of the curve fit was found to be 2.65. The resulting thermal conductivity was found to be **1.75 Btu/hr-ft-°F**.

THERMAL DIFFUSIVITY

The reported drilling log for this test borehole indicated that the formation consisted of topsoil, till, shale, and quartz. An average heat capacity value for shale was calculated from specific heat and density values listed by Kavanaugh and Rafferty[1]. A weighted average of heat capacity values based on the indicated formation was used to determine an average heat capacity of 32.0 Btu/ft^3-°F for the formation. A diffusivity value was then found using the calculated formation thermal conductivity and the estimated heat capacity. The thermal diffusivity for this formation was estimated to be **1.31 ft^2/day**.

.

[1]Stephen P. Kavanaugh and Kevin Rafferty, Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems (Atlanta: ASHRAE, 2014), 75.

CERTIFICATE OF CALIBRATION

GRTI maintains calibration of the datalogger, current transducer and voltage transducer on a regular schedule. The components are calibrated by the manufacturer using recognized national or international measurement standards such as those maintained by the National Institute of Standards and Technology (NIST).

FTC Unit 255

DA Unit 39

Primary Equipment		
Component	Calibration Date	Calibration Due Date
Datalogger	8/1/2023	8/1/2026
Current Transducer	8/15/2023	8/15/2026
Voltage Transducer	8/15/2023	8/15/2026

GRTI periodically verifies the combined temperature sensor/datalogger accuracy via a water bath. Temperature readings are simultaneously taken with a digital thermometer that has been calibrated using instruments traceable to NIST.

Date	9/8/2023			
Thermocouple 1 (°F)	74.4 74.4 74.5			
Thermocouple 2 (°F)	74.4 74.5 74.6			
Thermocouple 3 (°F)	74.4 74.5 74.6			
Thermocouple 4 (°F)	74.5 74.6 74.7			
Digital Thermometer (°F)	74.6 74.6 74.7			

WESTERN OFFICE
PO Box 256, Elkton, SD 57026
P: 866-991-4784 F: 605-542-6099

EASTERN OFFICE
6 William Warren Dr, Asheville, NC 28806
P: 828-275-7113

APPENDIX C

REMEDIAL ACTION WORKPLAN

PART 1 – GENERAL

The following Remedial Action Workplan (R.A.W.) has been prepared by engineers at C.T. Male Associates on behalf of Ulster County for its participation in the New York State Brownfield Cleanup Program.

Currently under review by the Department of Environmental Conservation, the proposed plan has not yet received approval.

All Site Work bids (Contract #5) are to be based on the procedures and protocols herein.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION

A. Work on site shall adhere to all portions of the R.A.W. including but not limited to:

1. The Remedial Action Approach.
2. Temporary Construction Facilities
3. Site Controls During Remedial Action
4. Health and Safety Plan
5. Confirmation and Documentation Sampling
6. Site Restoration

January 29, 2024
Revised August 27, 2024

NYS Brownfield Cleanup Program

Remedial Action Work Plan

Former Plesser Property
Paradies Lane
Town of New Paltz
Ulster County, New York
NYSDEC BCP ID No. C356053

Prepared for:

Urbahn Architects PLLC
306 West 37th Street
New York, New York 10018

On Behalf of:

Ulster County Planning Department
244 Fair Street
Kingston, New York 12402

Prepared by:

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE
& LANDSCAPE ARCHITECTURE, D.P.C.
12 Raymond Ave
Poughkeepsie, New York 12603
(845) 454-4400

C.T. Male Project No: 23.3070

CERTIFICATION
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK
REMEDIAL ACTION WORK PLAN

I, Rosaura Andújar-McNeil, P.E., certify that I am a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) dated May 3, 2010, and Green Remediation (DER-31), dated August 11, 2010.

097844		
NYS Professional Engineer #	Date	Signature

BROWNFIELD CLEANUP PROJECT
REMEDIAL ACTION WORK PLAN
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK

TABLE OF CONTENTS

BROWNFIELD CLEANUP PROJECT
REMEDIAL ACTION WORK PLAN
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK

TABLE OF CONTENTS

BROWNFIELD CLEANUP PROJECT
REMEDIAL ACTION WORK PLAN
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK

TABLE OF CONTENTS

BROWNFIELD CLEANUP PROJECT
REMEDIAL ACTION WORK PLAN
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK

TABLE OF CONTENTS

BROWNFIELD CLEANUP PROJECT
REMEDIAL ACTION WORK PLAN
FORMER PLESSER PROPERTY, NEW PALTZ, NEW YORK

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION & PURPOSE

1.1 Introduction

On behalf of the Ulster County Planning Department, C.T. Male Associates Engineering, Surveying, Architecture & Landscape Architecture, P.C. (C.T. Male) has prepared this Remedial Action Work Plan (RAWP) pursuant to the New York State Department of Environmental Conservation (NYSDEC or Department) Brownfield Cleanup Program (BCP) for the property known as the Former Plesser Property located on Paradies Lane in the Town of New Paltz, Ulster County, New York (herein "the Site").

The Site is located on an irregular-shaped parcel of undeveloped land comprised of two (2) tax parcels: Section 86.12, Block 5, Lots 13.310 and 13.320. The combined parcels are approximately 57.3 acres in size. The parcels that comprise the Site lack a physical address. The location of the Site is shown on Figure 1 – *Site Location Map* in Appendix A. Please note that the boundaries of the BCP site do not fully align with the parcel boundaries.

Mega Funworks, Inc., the initial BCP Applicant, entered the BCP as a Volunteer in May 2015 for an approximate 35.98-acre portion of the property (hereinafter, the Site, BCP ID No. 356053) as documented in the Brownfield Cleanup Agreement (BCA, Index No.: C356053-03-15). The BCA has been amended two times: first to add Turk Hospitality Group, LLC and Wildberry Lodge LLC as additional Volunteers and second, to add Ulster County as an additional Volunteer.

The northern portion of the Site is zoned as Gateway Business (GB), and a southern portion is zoned as Light Industrial (I-1). The Site is anticipated to be redeveloped as an Emergency Call Center for Ulster County and possibly, in the future, a Large-Scale Solar Array. The development of these two (2) uses is anticipated to occur in phases with the Emergency Call Center as the initial development. Refer to Exhibit 1 –*Site Plan* for the Emergency Call Center in Appendix A.

The proposed remedy for the Site will pursue 6 NYCRR Part 375 Track 4 Cleanup Track which consists of Restricted Commercial Use with site-specific SCOs. The main elements of the proposed remedy consist of limited excavation of soil with pesticide concentrations (dieldrin) in excess of Protection of Groundwater SCOs adjacent to monitoring wells

exhibiting impacts from dieldrin, excavating and/or relocating soil with pesticide and/or heavy metal concentrations in excess of Commercial SCOs for placement beneath the soil cover system which will occur as part of the site construction activities, removal of an Underground Storage Tank (UST) and associated petroleum impacted soil (if encountered), placement of a surface cover system, and the implementation of Institutional Controls (Site soil and groundwater use restrictions).

1.2 Purpose and Goal

The purpose of the RAWP is to provide a plan for the selected Site remedy. A Site Plan has been developed by Ulster County. The future Site development plans will include excavation and grading plans, groundwater dewatering plans (as needed), and stormwater management plans that will incorporate the Site remedy as approved by the NYSDEC.

The goal of this RAWP is to provide environmental guidance to the project design and construction team for the preparation of technical specifications, and bidding and construction documents to support the proposed Site development and remediation. This guidance is intended to incorporate remedial action requirements as approved by the NYSDEC into the overall project construction documents.

Ulster County will comply with the requirements identified in the NYSDEC-approved RAWP during construction activities performed at the Site.

For the purposes of the remedial action described herein, the Remediation Engineer is the individual or firm licensed or otherwise authorized under article 145 of the Education Law of the State of New York to practice engineering and responsible for the oversight of the remedial action. The Remediation Engineer will be responsible for providing a certification that the remedial action was performed in accordance with all applicable statutes and regulations and in substantial conformance with the NYSDEC's Department of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) upon completion of the remedial action.

2.0 NATURE AND EXTENT OF CONTAMINATION

2.1 Previous Investigations Prior to the Remedial Investigation

Contaminants have been documented at the Site during several previous investigations prior to the Remedial Investigation (RI). Historic use of the Site and the findings of previous investigations performed identified impacts to on-Site soil and groundwater. A brief chronological summary of the investigations prior to the RI is provided below:

- Phase I Environmental Site Assessment, Plesser Property, 57 Acres of Undeveloped Land, Town of New Paltz, Ulster County, New York, April 30, 2014, prepared by The Chazen Companies (Chazen), 21 Fox Street, Poughkeepsie, New York.
- Phase II Environmental Site Assessment, Plesser Property, Paradies Lane, New Paltz, Ulster County, New York, NYSDEC Spill No. 14-01829, dated June 18, 2014, prepared by DT Consulting Services, Inc. (DTCS).
- Draft Environmental Impact Statement (DEIS) for The Wildberry Lodge Site Plan, by Engineering & Surveying Properties PC, dated November 7, 2017, Revised February 28, 2019

The following summarizes these past environmental investigations.

<u>2014 Chazen Phase I ESA</u>

The Chazen report identified the following recognized environmental conditions:

- Historical uses of the central and northeastern sections of the Site included an apple orchard. The owner reported that pesticides exist in shallow soils in the area of the former orchard; however, supporting documentation and concentration information was not provided. It is also not known if pesticides were applied according to their labeled directions. Given the reported presence of pesticides in soil, but the limited associated information, this is considered a Significant Data Gap (SDG).
- Five structures (i.e., one barn, one garage and three unidentified structures), constructed circa 1949, were previously located on the Site. The three unidentified structures were demolished circa 1978-1994, while the remaining barn and garage

were demolished in 2003. Records searched could not confirm if any of the five structures contained heating systems and the usage of the three unidentified structures. This lack of information represents an SDG, according to the Chazen report.

- A waste pile was noted in the southwestern section of the Site (area of one demolished unidentified structure) and included empty containers of raw product (e.g., approximately twenty 1-gallon buckets for oil/grease, one 5-gallon fuel container, two 15-gallon drums with unknown contents). No staining and/or odors were noted on surfaces underneath these containers; however, it is unknown if containers were empty when placed in this area and what were the contents of these containers. Therefore, this waste storage is considered an SDG.
- A Shell gasoline station located adjacent to the Site is associated with one open NYSDEC spill and identified as a Petroleum Bulk Storage (PBS) facility. Four underground storage tanks (USTs) exist on-site: 8,000-gallon gasoline, 6,000-gallon gasoline, 4,000-gallon diesel, and 1,500-gallon petroleum. One spill incident (No. 98-14530) was reported for discovery of soil contamination during tank removal and was closed by the NYSDEC on December 15, 2014. Presumed groundwater flow direction in this area is away from the Site (southeast); however, as this could not be confirmed, the Spill represents an SDG for the Site. In addition, this petroleum spill indicates that potential vapor intrusion issues cannot be ruled out for the Site, but it should be noted that the NYSDOH does not currently regulate petroleum compounds when considering vapor intrusion concerns.
- A rusted empty and unlabeled 55-gallon container was noted in front of the auto-repair garage property encroachment but still on-site. No staining and/or leakage were noted in the area; however, the historical drum contents are unknown and therefore considered an SDG.
- A small clearing is noted in the extreme southwest corner of the Site in the 1994 aerial photograph but appears subsequently wooded. The reason for a temporary clearing is unknown; however, there was no evidence of material storage or stressed vegetation; therefore, it is not a Recognized Environmental Condition (REC).
- An adjacent auto repair facility's overflow parking area encroaches onto the central eastern section of the Site. A close-up inspection of the encroachment could not be conducted as it was incorporated in the neighboring property. This is considered an SDG, although, evidence of releases was not observed in this area.

2014 DTCS Phase II ESA Findings

Based on the results of the Phase I ESA, a Phase II ESA was performed. DTCS advanced a total of forty-two soil borings on the Site. DTCS summarized the Phase II ESA findings as follows:

- Laboratory data for soil samples obtained from the UST area, located within the northeastern portion of the Site (SB-7) revealed low concentrations for several targeted volatile organic compounds (VOCs) at depths between 8 and 12 feet below ground surface (bgs).
- Surficial soil samples were obtained from within the historical orchard areas (central and north–northeastern portions of the property). These samples indicated elevated concentrations of arsenic and lead, exceeding unrestricted and restricted residential NYSDEC Subpart 375-6: Remedial Program SCOs, December 2006.
- DTCS concluded subsurface soil impacts exceeding Unrestricted Use and Restricted Residential Use SCOs were encountered within soil borings SB-19, 25, 30, 31, 32-34, 36, 39 and SB-42 in the portion of the property historically utilized as an orchard. The two compounds of concern within these samples are arsenic and lead.
- Two copper lines were discovered protruding out of the concrete pad located in the northeastern quadrant of the Site. Scanning the subsurface surrounding this area with ground penetrating radar revealed a UST approximately two (2) feet bgs. Data recorded while gauging the storage vessel indicated the tank contained 21 inches of liquid (mainly water with slight petroleum odor) and is estimated to have a storage capacity of 550 gallons. The spill incident number associated with the discovery of this UST (No. 14-01829) has yet to be closed. The location of this UST is shown on Figure 4 – *Remedial Action Implementation Plan and Details* in Appendix A.

Draft Environmental Impact Statement (DEIS) for the Wildberry Lodge Site Plan

- This DEIS assessed impact from 2014 and 2017 design alternatives for the now obsolete Wildberry Lodge Project. Data usage from the DEIS, was limited to the wetland delineation assessment performed by Robert Torgersen Landscape Architect. This delineation concluded that 10.89 acres of the property are designated Town of New Paltz Wetlands, 9.67 acres of which are under United

States Army Corp of Engineers (USAOE) jurisdiction. No NYSDEC wetlands were identified on site. The identified wetlands are located adjacent to but outside of the BCP Site boundaries.

2.2 Remedial Investigation

The nature and extent of Site contaminants were identified by the RI, conducted in 2016. Subsequently to the 2016 RI, NYSDEC requested the sampling for emergent contaminants in on-site groundwater, which was completed in 2019. Furthermore, a Supplemental Remedial Investigation was conducted in April of 2023 to further delineate pesticide contamination in on-site soils. The results of the 2016, 2019 and 2023 investigation are presented in a Revised RI Report, dated January 2024.

The RI involved the collection and analysis of surface soil samples; the advancement of test pits and test borings for the collection and analysis of soil samples and to evaluate the Site's subsurface conditions; the installation of groundwater monitoring wells, the collection and analysis of groundwater samples, Contaminant Fate Transport Modeling, a Qualitative Human Health Exposure Assessment, and a Fish and Wildlife Assessment.

The primary contaminants of concern (COC) at the Site are:

- Heavy metals arsenic, chromium, lead, manganese, and mercury, and the pesticides dieldrin, dichlorodiphenyldichloroethylene (DDE, surface soils only) and dichlorodiphenyltrichloroethane (DDT) in both surface and subsurface soils (unless otherwise noted).
- Heavy metals iron, lead, and manganese, and the pesticide dieldrin in groundwater.

Analytical results for surface and subsurface soils and groundwater were compared to the site-specific Standards, Criteria and Guidance (SCGs). Table 2.2-1 lists those compounds and analytes that exceeded site-specific SCGs along with the frequency that the applicable SCG was exceeded per analyzed media. Site-specific SCGs for compounds in soil are defined as Commercial Use SCOs and Protection of Groundwater SCOs (for dieldrin only). Site-specific SCGs for compounds in groundwater are defined as NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) for Water Class GA and Type H(WS).

Please note that Table 2.2-1 does not list exceedances documented in the Supplemental Remedial Investigation. See Section 2.3 for the discussion of the results of the Supplemental Remedial Investigation.

TABLE 2.2-1: COMPOUNDS AND ANALYTES EXCEEDING SCGs PER MEDIA TYPE

Media	Class	Contaminant of Concern	Detected Concentration Range	Frequency Exceeding Standard	Applicable SCG
Surface Soils (mg/kg)	Pesticides	Dieldrin[2]	0.12-3.4	16 of 42	0.1
		p,p'-DDE	10-30	4 of 42	8.9
		p,p'-DDT	14-28	4 of 42	7.9
	Metals	Arsenic, Total	18-370	24 of 42	16
		Chromium, Total	37	1 of 42	36
		Lead, Total	420-3,000	12 of 42	400
		Manganese, Total	2,100-3,500	7 of 42	2,000
		Mercury, Total	0.88-17	17 of 42	0.81
Subsurface Soils (mg/kg)	Pesticides	Dieldrin[2] (Test Pits)	0.25	1 of 19	0.1
		Dieldrin[2] (Soil Borings)	0.1-0.71	4 of 11	0.1
		p,p'-DDT (Soil Borings)	12	1 of 11	7.9
	Metals	Arsenic, Total (Soil Borings)	18-240	5 of 11	16
		Arsenic, Total (Test Pits)	17-57	4 of 19	16
		Chromium, Total (Soil Borings)	41	2 of 11	36
		Lead, Total	610-860	2 of 11	400

TABLE 2.2-1: COMPOUNDS AND ANALYTES EXCEEDING SCGs PER MEDIA TYPE					
		(Soil Borings)			
		Manganese (Soil Borings)	2,100-2,400	3 of 11	2,000
		Manganese (Test Pit)	2,100-2,300	3 of 19	2,000
		Mercury (Soil Borings)	0.91-4.1	4 of 11	0.81
Groundwater (ug/L)	Pesticides	Dieldrin	0.02	2 of 11	0.004
	Metals	Iron, Total	470-37,000	11 of 11	300
		Lead, Total	38	1 of 11	25
		Manganese, Total	340-2,900	3 of 11	300

Table Notes:

(1) NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs, Subpart 375-6 Commercial Use Soil Cleanup Objectives for soils and NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), Ambient Water Quality Standards and Guidance Values and Effluent Limitations, June 1998 for groundwater.

(2) NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs, Subpart 375-6 Protection of Groundwater SCO guidance value is used for comparison with Dieldrin.

Refer to Figures 2A – *Map of Fill/Surface Soil Exceeding SCGs*, 2B - *Map of Fill/Subsurface Soil Exceeding SCGs*, and 2C – *Map of Fill/Test Pit Soils Exceeding SCGs* and Figure 3 – *Map of Groundwater Exceeding SCGs.*

No soil vapor data was collected as part of the RI. The State of New York does not have any SCGs for volatile chemicals in soil vapors. New York State Department of Health (NYSDOH) utilizes several decision matrices for evaluating the potential for soil vapor intrusion. These decision matrices are presented in the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (GESVI), dated October 2006. Potentially applicable matrix values and/or relatively high concentrations of VOCs will be identified in any future soil vapor data collected for the Site, as deemed necessary by NYSDEC. A vapor intrusion (VI) assessment will be conducted to determine the potential for VI impacts and the need for mitigation measures, if warranted.

2.3 Supplemental Remedial Investigation

Following submittal of the RI Report by C.T. Male in April of 2022 (summarizing the 2016 and 2019 investigations), the NYSDEC and NYSDOH requested additional investigative work via comments on the RI Report (see, NYSDEC comment letter, dated July 21, 2022). C.T. Male issued a letter report titled *Response to Comments: Revised Remedial Investigation Report (RRIR)*, dated May 24, 2023, documenting this additional investigation. Subsequently NYSDEC requested (following the issuance of the *May 2023 RRIR*) that the 2023 investigation be incorporated in the RI Report issued in 2022. Furthermore, another comment letter from the NYSDEC was received on October 4, 2023. These comments have been addressed in a revised RI Report which was submitted on January 30, 2024. An additional comment letter from the NYSDEC was received on April 8, 2024. A revised RIR to address these comments is pending.

A summary of the 2023 supplemental remedial investigation work performed in accordance with the DEC-approved work plan dated September 7, 2022. is provided below.

C.T. Male performed surface soil sampling and dieldrin delineation via test pit soil sampling and water level measurements on April 17th and 18th, 2023, in accordance with the DEC-approved work plan dated September 7, 2022. This additional investigative work is listed below.

Additional Surface Soil Sampling

Seven (7) additional shallow soil samples designated as SS-43 to SS-49 were collected from the surface to two (2) inches bgs interval along the intersection of the wetland borders and drainage flow paths. Note: SS-01 to SS-42 were collected during the April 2016 RI. Laboratory results were compared to NYSDEC 6 NYCRR Part 375 Environmental Remediation Program, Subpart 375-6 Restricted Commercial Use and Protection of Groundwater Soil Cleanup Objectives (SCOs). Surface soil samples were submitted for analysis of TAL metals, cyanide, polychlorinated biphenyl compounds (PCBs), pesticides, and semi-volatile organic compounds (SVOCs).

One (1) sample (SB-46) exhibited metals slightly above applicable SCOs (arsenic and lead). None of the seven (7) samples exhibited pesticide, PCB or SVOC concentrations

above applicable SCOs. One or more SVOC compounds were detected in four (4) of the seven (7) samples analyzed.

Dieldrin Delineation

A total of fourteen (14) exploratory test pits were excavated. Seven (7) test pits were located at approximately 50-foot intervals, out to 100 feet in four (4) cardinal directions (where possible) of existing groundwater monitoring wells MW-3 and MW-6 (monitoring wells where exceedances of dieldrin were documented in groundwater). Each test pit was excavated from the surface to a terminal depth of eight feet (8) bgs, or to groundwater, whichever was encountered first.

The depth intervals bgs that were sampled at each test pit included 0-2 feet, 2-4 feet, and the excavation bottom which was typically eight (8) feet bgs. At test pit locations where groundwater was encountered prior to eight (8) feet, the bottom sample was collected from within the vadose zone located immediately above observed groundwater. The samples were submitted to Alpha Analytical for analysis of pesticides via USEPA Method 8081B.

<u>Test pits excavated around monitoring well MW-3</u>

- To the north: MW3-TPN1, MW3-TPN2
- To the south: MW3-TPS1, MW3-TPS2
- To the west: MW3-TPW1
- To the east: MW3-TPE1, MW3-TPE2

<u>Test pits excavated around monitoring well MW-6</u>

- To the north: MW6-TPN1, MW6-TPN2
- To the south: MW6-TPS1
- To the west: MW6-TPW1, MW6-TPW2
- To the east: MW6-TPE1, MW6-TPE2

A total of forty (40) test pit soil samples were submitted for analysis of pesticides. No pesticides were detected above Commercial Use SCOs. Three (3) samples exhibited a dieldrin concentration above the Protection of Groundwater SCOs (PGW SCOs) of 0.1 ppm as follows:

- Sample MW6-TPW1 (0-2 feet) exhibited a dieldrin concentration of 0.623 parts per million (ppm)

- Sample MW3-TPN2 (0-2 feet) exhibited a dieldrin concentration of 0.274 ppm
- Sample MW3-TPE2 (0-2 feet) exhibited a dieldrin concentration of 0.297 ppm

4,4'-DDD, 4,4'-DDE 4,4'-DDT, endosulfan II, and endosulfan sulfate concentrations were also detected in test pit soil samples but none of these compounds were detected above applicable SCOs (Commercial Use and PGW SCOs).

The three (3) samples exhibiting dieldrin concentrations exceeding PGW SCOs were limited to three (3) isolated surface locations: MW3-TPN2, MW3-TPE2, and MW6-TPW1. No subsurface soil samples exceeded applicable SCOs at any of the test pits. Surface delineation around both wells did not identify an isolated source region for the dieldrin observed in groundwater in these two wells. Dieldrin concentrations above PGW SCOs are limited to surface soils, located sporadically across the Site, and appear to be consistent with surficial deposition during application of pesticides at an orchard.

Groundwater Gauging

C.T. Male measured the water level in eleven (11) existing groundwater monitoring wells identified as MW-01 through MW-11 to evaluate inferred groundwater flow direction. Based on the groundwater elevations recorded, groundwater flow is inferred to be generally toward the east/southeast direction across the Site. Groundwater gauging is summarized below:

Table 2.3.1 below summarizes depth to groundwater measured during this SRI, and total well depth as reported in the RI.

Table 2.3.1: Groundwater Monitoring Well Gauging Data

Groundwater Monitoring Well ID	Ground Elevation[1] (feet)	Groundwater Depth (feet bgs)	Groundwater Elevation (feet)	Monitoring Well Depth (feet bgs)	Monitoring Well Screened interval (feet bgs)
MW-01	378.6	5.3	373.339	15.5	5-15
MW-02	378.5	5.0	373.494	15	5-15
MW-03	382.3	7.4	374.829	13.5	5-13.5
MW-04	378.3	2.7	375.584	14	4-14
MW-05	377.8	1.4	376.382	12.5	4.5-12.5
MW-06	375.7	3.6	372.156	11.5	4-11.5
MW-07	368.9	2.6	366.266	14	4-14
MW-08	369.0	2.8	366.247	9.5	4-9.5
MW-09	365.8	2.9	362.861	12	4-12
MW-10	366.8	4.4	362.309	12	4-12
MW-11	376.7	1.6	375.111	10	4-10

Legend: [1]Ground elevation data is referenced from a CTM survey using the North American Vertical Datum 1988 coordinate system (NAVD88).

3.0 DEVELOPMENT OF ALTERNATIVES

3.1 Introduction

The results of the RI and supplemental RI investigations were used to develop and evaluate the remedial alternatives described within this report.

Feasible remedial action(s) are identified to achieve compliance with established regulatory cleanup guidance levels, and/or to protect human health and the environment. The remedial alternatives for the Site are developed based on published literature and current knowledge of the technologies commonly employed in similar situations and circumstances. The remedial action objectives, general response actions, and development of remedial alternatives are presented in the following sections.

3.2 Remedial Action Objectives

Table 3.2-1 summarizes the Contaminants of Concern (COCs) within each medium and the remedial action objectives (RAOs) identified for each medium. Per correspondence received from the Department on August 14, 2023, the main RAOs have been limited to groundwater, subsurface soils, and near-surface soils. The COCs include compounds and analytes which exceeded their respective SCGs. It is C.T. Male's opinion that the source of the COCs is the historic use of pesticides on-site. Impacts documented in soils and groundwater are primarily from on-site sources. There appear to be impacts associated with the historic use of the Site.

Potentially affected populations described in Table 3.2-1 include future users of the Site, persons who may be engaged in the future commercial activities at the Site, residents and workers in the nearby commercial buildings and nearby residential neighborhood, Site visitors and trespassers on the Site, and workers who may be engaged in remediation or construction activities during future Site development.

Table 3.2-1: Contaminants of Concern for Site Media and Remedial Action Objectives		
Media Type	**COCs**	**Remedial Action Objective**
Surface and Sub-Surface Soil	Dieldrin and Metals	Prevent affected populations from direct contact and ingestion of the contaminated soils and inhalation of airborne dust that may emanate from the soils should they be disturbed. Prevent migration of contaminants that would result in impacts to groundwater or ecological resources.
Sub-Surface Soil	Petroleum Compounds (potentially encountered during UST removal)	Prevent affected populations from direct contact and ingestion of the contaminated soils and inhalation of airborne dust that may emanate from the soils should they be disturbed.
Groundwater	Dieldrin, Metals, Petroleum Compounds (potentially encountered during UST removal)	Prevent affected populations from direct contact and ingestion of the groundwater containing contaminant levels above drinking water standards, prevent contact with, or inhalation of, VOCs potentially emanating from contaminated groundwater, and limit, reduce or prevent the discharge of contaminated groundwater to surface water.
Soil Vapor	Unknown	Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the buildings at the Site. A VI assessment would be conducted at any occupied building to determine the need for monitoring or mitigation.

The RAOs are to mitigate, reduce, and if possible, eliminate potential exposure pathways in the various media within the Site, with the ultimate goal of protecting human health and the environment.

In developing RAOs for the subject Site, the following design and development considerations were evaluated relative to economical and feasible solutions for addressing the Site contaminants:

- The Site is being considered for redevelopment for commercial purposes. The proposed use is consistent with local zoning. The remedial action will significantly reduce if not eliminate potential exposure to COCs by Site visitors and workers should the Site undergo future development activities, as well as by future occupants of buildings constructed on the Site.

- Excavation to pre-disposal conditions would require the removal of a significant amount of soil and some solid waste and is not feasible or practical. It would be difficult to excavate the entire residual source, given its configuration and the local geologic conditions.

- The consequences of the Site remaining undeveloped due to the difficulties of remediating the Site should be taken into consideration.

The anticipated use for the Site is "Commercial Use". The applicable SCGs for each media to be used for remedial action are summarized as follows:

Media	Regulation	SCGs
Soil	6 NYCRR Part 375 (December 14, 2007) Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs (April 2023)	Table 375-6.8(b) Commercial Use/Protection of Groundwater Soil Cleanup Objectives PFOA and PFOS Guidance Values for Anticipated Site Use
Soils within the Town of New Paltz Wetland Buffer Zone	6 NYCRR Part 375 (December 14, 2007) Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs (April 2023)	Table 375-6.8(b) Protection of Ecological Resources Soil Cleanup Objectives PFOA and PFOS Guidance Values for Anticipated Site Use

Media	Regulation	SCGs
Groundwater	NYSDEC Division of Water TOGS 1.1.1 with Addenda	Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (June 1998, with 2023 Addendum) – Class GA Source of Drinking Water (Groundwater)
Soil Vapor	None	Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 and May 2017 updates

A copy of 6 NYCRR Part 375 Table 375-6.8(b) and an excerpt from Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs which includes Guidance Values for Commercial Use Sites is included in Appendix B for reference. The SCOs (a.k.a. SCGs) for Restricted Commercial Use Sites are identified under the column headings "Protection of Public Health – Commercial". The NYSDEC Division of Water TOGS 1.1.1 document is not included, but the standard or guidance values for the remedial action will be the Class GA fresh groundwater and Class D for surface water.

Currently, there is no regulation that establishes SCGs for soil vapor investigation or mitigation. In lieu of a regulation, the NYSDOH prepared guidance document, entitled *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 and May 2017 updates*, will be used for applicable SCGs, if necessary.

3.3 General Response Actions

The project Site is impacted by varying concentrations of pesticides and metals (likely derived from the application of pesticides; specifically lead-arsenate) in subsurface and near-surface soils; and metals and pesticides in groundwater. The general response actions are developed to address Contaminants of Concern (COCs) present within the Site through a site-specific remedial alternative. The General Response Actions will address:

- COCs in soils exceeding SCOs for Commercial Uses;
- COCs in groundwater exceeding SCGs to the extent practical; and
- Reduction of the potential for future impacts to nearby ecological resources.

3.4 Development of Alternatives

The following sections present a selection of remedial alternatives that may be implemented to address the general response actions discussed in the previous section of this report. The alternatives under consideration include:

Alternative No. 1: No Action

- The Site will remain as is with no remediation proposed.
- No excavation or covering of impacted soils will take place.
- No monitoring and/or institutional/engineering controls will be implemented.

Consideration of this alternative is useful as it established a baseline against which other alternatives are compared.

Alternative No. 2: Excavation to Unrestricted Use SCOs

- Sampling (as warranted), management, segregation, and disposal of on-site surface materials (i.e., stumps, brush, incidental C&D materials, refuse and debris);
- Excavation and disposal of all waste material and soils exceeding Unrestricted SCOs;

- Groundwater dewatering and treatment as necessary during excavation activities;
- Backfilling all excavations with NYSDEC-approved material; and,
- Due to the dieldrin and metals contamination in groundwater, groundwater treatment and/or institutional controls in the form of an environmental easement restricting future groundwater use will likely be necessary.

Alternative No. 3: Limited Excavation, Surface Cover, Institutional and Engineering Controls, and Monitored Natural Attenuation of Groundwater Impacts.

- Excavation and disposal of pesticide impacted soils exceeding the PGW SCOs soils, specifically in the central portion of the Site were corollary impacts to groundwater were observed from dieldrin;
- Sample (as warranted), manage, segregate, and dispose of on-site surface materials (i.e., stumps, brush, incidental C&D materials, refuse and debris);
- Perform limited excavation(s) and dispose (if warranted) petroleum impacted soil surrounding the existing UST and/or soils that are not suitable for construction purposes to facilitate development. Replace the excavated soil with construction grade fill;
- Contain and treat or off-site disposal of impacted groundwater encountered during construction that may be generated from dewatering activities;
- Installation of a barrier demarcation layer to define the boundary between clean backfill and contaminated soils;
- Placement of a surface cover system, inclusive of building foundation and slab, pavement, soils meeting applicable SCOs;
- Conduct environmental monitoring to measure the effectiveness of the remedy and use restrictions/limitations to prevent exposure to remaining contaminants; and,

- Establish institutional controls in the form of an environmental easement restricting future land use and groundwater use and requiring periodic inspection of the engineering controls for the Site.

3.4.1 Alternative No. 1: No Action

This alternative assumes that the Site will remain as is and that the potential threats to human health and the environment from the Site will not be addressed, and that no remediation will be performed.

3.4.2 Alternative No. 2: Excavation to Unrestricted Use SCOs

This alternative would involve the excavation and disposal of waste material and contaminated soil within and potentially beyond the Site boundaries. Upon completion of the remedy, those portions of the Site that will be re-used would be backfilled with NYSDEC-approved backfill material.

Groundwater remediation would involve extraction and treatment as needed during Site work. Based on the likely soil excavation depths, the impacted groundwater treated would effectively be remediated via extraction and treatment, during construction. There may be a residual component of impacted groundwater. The effectiveness of this action would be evaluated via monitored natural attenuation.

Periodic groundwater sampling would be required for an indeterminate period of time to gauge the effectiveness of the remedial action (e.g., required for a period of five [5] years). Removal of the source (contaminated soils) would likely result in groundwater quality improvements.

Approximately 20 acres (871,200 square feet) are impacted with contaminated soils, with an average depth of waste material of approximately 2 feet (deeper excavation might be warranted in selected areas). This translates into the removal of approximate 64,600 cubic yards of soil impacted above Unrestricted SCOs. Based on a conversation factor of 1.7 tons per cubic yard, this equates to approximately as much as 110,000 tons of impacted soil requiring removal.

Groundwater was not encountered in appreciable quantities during test pit excavation, and it is not anticipated to be encountered in shallow soils. Groundwater might be

encountered in selected areas where excavation extends beyond 2 feet. If encountered, groundwater will need to be evacuated, temporarily stored, treated and disposed of.

The remedial technologies described above for remediation of impacted soils is common practice but would require significant infrastructure to meet the RAOs for this alternative.

3.4.3 Alternative No. 3: Limited Excavation, Surface Cover Installation, Institutional and Engineering Controls, and Monitored Natural Attenuation of Groundwater Impacts

Prior to initiating construction, a limited removal action would be initiated to address the potential presence of dieldrin impacted soils in the south-central portion of the Site. Soils in portions of the Site with elevated levels of pesticides and metals exceed Commercial SCOs and/or the Protection of Groundwater SCOs. The limits of the dieldrin impacted soil were defined as part of the supplemental remedial investigation, and would be excavated for off-site disposal.

On-site surface materials (i.e., stumps, brush, refuse, and C&D materials) would be collected, sampled (if warranted), managed, segregated and disposed off-site at a permitted facility following sample collection and testing, as warranted.

Alternative No. 3 provides flexibility in the addressing soils exceeding site-specific SCOs. Soils exceeding site-specific SCOs could either be removed and disposed off-site or be left in place below a demarcation layer and a surface cover system.

Following the limited excavation and/or soil relocation, a surface cover system will be installed. The surface cover system will consist of building concrete floor slabs, asphalt pavement, concrete walkways and a 12-inch layer of NYSDEC-approved backfill material meeting applicable SCOs in proposed landscaped areas.

In the event that groundwater is encountered during placement of the cover system or during any Site activity (construction, etc.), the groundwater would be extracted, and temporarily stored. Alternatives for groundwater handling, management, treatment and/or disposal will be further defined in the Remedial Design Document. No long-term groundwater collection and treatment systems are needed or proposed. Erosion and sediment control measures will be installed and maintained throughout the course of remediation.

In addition to the surface cover system, engineering controls could include fencing to ensure that users of the site are not exposed to impacted soil. Institutional controls in the form of an environmental easement restricting future land use and groundwater use and requiring periodic inspection of the engineering controls for the Site will be imposed.

The engineering and institutional controls would be incorporated into an environmental easement granted to the NYSDEC, which would then have the authority to enforce the terms of the easement and to notify future owners and/or developers of the restricted use of the property.

Implementation of the Site Management Plan (SMP) would provide specific requirements for future Site development, use and occupation. Long-term monitoring of the Site's groundwater would be conducted periodically for a period of at least five (5) years to gauge the effectiveness of the remedy.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

4.1 Introduction

Each remedial alternative was evaluated based on specific criteria set forth in 6 NYCRR Part 375-1.8(f) and Section 4.2 of DER-10.

The first two evaluation criteria (No. 1 and 2 below) are threshold criteria and must be satisfied in order for an alternative to be considered for evaluation. The next six (6) evaluation criteria (No. 3 to 8 below) are primary balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives. After the Decision Document is subject to public comment, the final criterion (No. 9 below) is considered.

1. Overall protection of public health and the environment;
2. Compliance with Standards, Criteria, and Guidance (SCGs);
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume of contamination through treatment;
5. Short-term impact and effectiveness;
6. Implementability;
7. Cost effectiveness;
8. Land use; and
9. Community acceptance.

Institutional controls are means of attaching restrictions on the property to limit Site activities and future use of the property, and to assure due diligence in notification of prospective purchasers and the public. These restrictions can also include the installation of fencing or other means to limit access to the Site or a particular area of the Site. The Site's current and future land use plays a significant role in selecting the most effective institutional controls. Examples of institutional controls typically include land use and groundwater/drinking water use restrictions, deed restrictions, and notification in public registries of excavation and construction work activity, and appropriate posting of informational signs at the Site. Depending on the severity of contamination, institutional controls could be required along with other feasible remedial alternatives. For the purpose of analyzing the alternatives below, specific examples of institutional controls

(as discussed above) are not referenced but would ultimately be selected based on the results of remedial action selected/performed.

Engineering controls means any method employed to actively or passively contain, stabilize, or monitor contamination; to restrict the movement of contamination to ensure the long-term effectiveness of a remedial program; or eliminate potential exposure pathways to contamination. Engineering controls include, but are not limited to, pavement, caps, covers, subsurface barriers, vapor barriers, slurry walls, building ventilation systems, fences, access controls, and provisions of alternative water supplies via connection to an existing public/private water supply, adding treatment technologies to impacted water supplies, and installing filtration devices on private water supplies.

The following sections examine each of the alternatives in turn as they correlate to the eight (8) evaluation criteria.

4.2 Alternative No. 1: No Action.

4.2.1 Overall protection of public health and the environment

Under this alternative, the property would be developed without directly mitigating the environmental issues as there will be no remediation and no institutional and/or engineering controls to protect human health and the environment. Any reduction in the concentration of metals, VOCs and SVOCs would be the result of natural attenuation, dispersion or dilution. Dispersion or dilution could potentially result in additional future groundwater impacts. Risk to human health from contact with impacted soil and groundwater exists and would not be lessened except by natural attenuation. The risks to public health and the environment would remain high.

4.2.2 Compliance with Standards, Criteria, and Guidance (SCGs)

This alternative does not comply with the SCGs. Development would not be protective of human health and the environment with COCs remaining in-place above SCGs. Although this option could be implemented, it provides no direct mitigation to existing

conditions thereby leaving health risk factors. The COCs may attenuate over time, but there would be no process in-place to monitor the attenuation.

4.2.3 Long-term effectiveness and permanence

There is no long-term benefit associated with this alternative. Although permanent, it relies on naturally occurring processes to address on-site and off-site contamination.

4.2.4 Reduction of toxicity, mobility, or volume of contamination through treatment

There would be limited reduction in the toxicity, mobility, and volume of the contaminants due to natural processes.

4.2.5 Short-term impact and effectiveness

There are no short-term adverse environmental impacts and/or human exposure through implementation of this alternative as no remediation will take place.

4.2.6 Implementability

This alternative could be implemented as it requires not further action.

4.2.7 Cost effectiveness

The No Action Alternative is not considered cost effective even though there are low foreseeable costs associated with this alternative as there would be no added protection to human health and the environment.

4.2.8 Land use

Redevelopment of this parcel is not likely under this alternative.

4.3 Alternative No. 2: Excavation to Unrestricted Use SCOs

4.3.1 Overall protection of public health and the environment

Protection of human health and the environment would be achieved through the implementation of Alternative 2, as the contaminated material would be removed to pre-disposal conditions by excavation and off-site disposal. The soil would be replaced by NYSDEC-approved clean fill to meet development grades. Contaminated groundwater in excess of SCGs, if encountered, would also be remediated during construction activities (less than five [5] years) employing treatment technologies during dewatering.

A short-term (less than five [5] years) institutional control would also be implemented. Periodic groundwater monitoring (for at least five [5] years) would be conducted to gauge the effectiveness of the groundwater remediation effort.

Alternative No. 2 will satisfy the RAOs for the Site as potential long-term exposure to contaminated soils and groundwater would be eliminated or substantially reduced.

4.3.2 Compliance with Standards, Criteria, and Guidance (SCGs)

Compliance with SCGs would be realized through the implementation of Alternative 2 as the contaminated soil and groundwater would be remediated.

4.3.3 Long-term effectiveness and permanence

Implementing Alternative No. 2 is a long-term and permanently effective means of remediating soil and groundwater contamination at the Site. There would be substantial reduction of risks remaining upon completion of this alternative. This alternative is considered to be a reliable means of reducing and possibly eliminating the potential impacts to human health and the environment.

4.3.4 Reduction of toxicity, mobility, or volume of contamination

Reduction of the toxicity, mobility or volume of the Site contaminants would effectively be realized through the implementation of Alternative 2 as the contaminated soil in excess of SCGs would be remediated through the excavation and disposal of the impacted soil and replacement with clean fill. By removing source areas, groundwater conditions would improve over time.

4.3.5 Short-term impact and effectiveness

The short-term effectiveness of this alternative for Site soils will be immediate in that contaminated soils will be removed and disposed of off-site. Groundwater remediation via dewatering and treatment during construction, if groundwater is encountered, will also be immediate. Periodic groundwater monitoring would be conducted to gauge the effectiveness of groundwater remediation. The community would be protected during the remedial action by establishing a work zone that excludes unauthorized individuals, and by employing effective dust suppression techniques (application of water) and community dust monitoring. There would be no significant adverse environmental impacts as a result of implementing this alternative.

Alternative No. 2 would have the greatest potential for short term impacts to Site workers and the community because a large volume of soils would be excavated and disposed off-site. It is estimated that the contaminated soil excavation and excavation dewatering (if needed) and treatment will take approximately 12 to 24 months to complete.

4.3.6 Implementability

The technical difficulties that are anticipated during implementation of this alternative are considered high due to the large volume of impacted soils being generated.

4.3.7 Cost effectiveness

The volume of soil to be removed is significant under this alternative. The full extent of the impacted soil and groundwater (if warranted) within the site is unknown and would require post excavation delineation to verify impacted materials have been removed. Furthermore, the technical difficulties that will be incurred to safely implement this alternative will add significantly to the cost. Overall, due to the significantly high cost

required to implement this alternative, as well as and the lack of assurance that the residual source of contamination could be removed to pre-disposal conditions, this alternative is not considered cost effective.

4.3.8 Land use

The Site was historically an orchard, and it is located in an area that is primarily commercial. Residential properties are located to the north of the proposed development. Implementation of this alternative would not have a negative effect on the intended use of the Site. Furthermore, the implementation of this alternative would allow for flexibility in the intended use of the Site.

4.4 Alternative No. 3: Limited Excavation, Surface Cover Installation, Institutional and Engineering Controls, and Monitored Natural Attenuation of Groundwater Impacts

4.4.1 Overall protection of public health and the environment

Limited excavation of soils is required to address pesticide contamination affecting groundwater quality. This coupled with the installation of a surface cover system, implementation of institutional and engineering controls, and SMP would serve as a mechanism to protect human health and the environment from the contaminants remaining after remedy implementation. Long-term monitoring would be conducted to gauge the effectiveness of the remediation effort. The implementation of institutional controls would serve to provide protection of the public health by controlling exposure pathways.

Alternative No. 3 would satisfy the RAOs for the Site, as human exposure to contaminated soils would be reduced by the limited excavation and the installation of a surface cover system and through implementation of the institutional controls and SMP. Human exposure to contaminated groundwater would be reduced through application of an institutional control restricting groundwater usage and access limitations to existing surface water and wetland areas. Groundwater impacts are anticipated to be reduced overtime due to the removal source areas and/or capping and containing impacted soils, which will prevent the infiltration of water through the contaminated soils.

4.4.2 Compliance with Standards, Criteria, and Guidance (SCGs)

Compliance with the applicable SCGs would not be attained through the implementation of Alternative No. 3. Under this alternative, a limited volume of soils will likely be disposed off-site, contaminated soils would remain in place and contaminants above SCGs could remain in groundwater. However, the public health would be protected from contaminants in soil and groundwater through the installation of a surface cover system, institutional controls, and implementation of the SMP.

Although Alternative No. 3 does not attain the SCGs for Unrestricted Use of the Site as described in Alternative No. 2, Alternative No. 3 offers acceptable protection to public health through application of the above-referenced institutional and engineering controls for the intended development.

4.4.3 Long-term effectiveness and permanence

The long-term effectiveness and permanence of Alternative No. 3 would be achieved by limited excavation and the installation of a surface cover system that would protect public health from Site contaminants, and by providing institutional and engineering controls that restrict how the Site is used. A Site Management Plan (SMP) would detail development and maintenance practices to address remaining contamination at the Site following the remedial action. There should be minimal long-term risks to human health if: 1) the cover material remains intact and is inspected annually, 2) long-term groundwater monitoring is conducted to gauge the effectiveness of the remedial effort, 3) SMP is followed by Site owners (present and future) and occupants, Site developers and any personnel involved in any future Site maintenance and development activities, and 4) institutional controls are implemented and followed by future Site owners and developers.

The contaminants remaining in soils would be encapsulated from the potentially impacted population once the placement of the surface cover system is complete. The surface cover system would be an effective means of protection from Site contaminants if it is consistently inspected to ensure that it has not been breached by naturally occurring and/or man-made incidents.

4.4.4 Reduction of toxicity, mobility, or volume of contamination

This alternative would moderately reduce the toxicity or volume of contaminants in soil or groundwater and limit mobility of select contaminants. Mobility of on-site soil contaminants into groundwater is expected to be limited since the metals and pesticides tend to adhere to soil and not readily migrate into groundwater.

4.4.5 Short-term impact and effectiveness

The short-term effectiveness is immediate upon installation of the surface cover system and implementation of the institutional controls and SMP. It is estimated the installation of the surface cover system would take approximately 6 to 12 months to complete.

Short term adverse impacts to affected populations during implementation of this alternative include the possible inhalation or dermal contact and inhalation of contaminants during Site remediation, although these exposures would be less in comparison to Alternative 2. To minimize these impacts, dust suppression techniques incorporating community dust monitoring at a minimum will be conducted during construction.

4.4.6 Implementability

Alternative No. 3 can be implemented in a straightforward manner. The surface cover system can be installed employing common engineering, reliable industry standards and construction practices.

The implementation of institutional controls and the SMP requires drafting of legal documents (e.g., environmental easement) and developing procedures that will be binding on future Site owners and developers. The institutional controls would be developed to protect affected populations during implementation of the remedial alternative and as guidance for future landowners and developer.

4.4.7 Cost effectiveness

The technical difficulties involved when implementing this remedy are limited. The technology and construction methods are commonly employed. No special engineering requirements would be necessary other than those commonly employed at remediation sites.

Overall, this alternative is cost effective. Most if not all of the remedy can be incorporated into future development activities. The cost associated with the installation of the surface cover system will be integrated into the Site development, which makes this remedy viable.

4.4.8 Land use

Alternative No. 3 allows the property to be redeveloped in a manner consistent with local land use. The Site could be used for Industrial or Commercial redevelopment consistent with local zoning.

4.5 Summary of Evaluation

Evaluation Criteria	Alternative No. 1	Alternative No. 2	Alternative No. 3
Overall protection of public health and the environment	Poor	Very Good	Good
Compliance with SCGs	Poor	Very Good	Fair
Long-term effectiveness and permanence	Poor	Very Good	Good
Reduction of toxicity, mobility, or volume of contamination through treatment	Poor	Good	Fair
Short-term impact and effectiveness	Poor	Good	Good
Implementability	Excellent	Poor	Good

4.6 Comparative Analysis

Utilizing the evaluation criteria, each remedial alternative is compared to the others, based on cost and effectiveness, as a means to identify the most cost-effective, and protective remedy. Each alternative is therefore ranked as low, moderate or high in terms of being a cost-effective, protective remedy. With the exception of Alternative 1, each of the alternatives satisfies the threshold criteria for overall protection of public health and the environment. Alternative No. 2 substantially complies with SCGs, while Alternative No. 3 moderately complies with SCGs and relies on natural attenuation for compliance with some SCGs. Alternative 1, No Action, addresses SCG compliance solely by relying on natural attenuation. Under Alternative 1, co changes to the site are anticipated to the

risk of exposure will remain high. Although Alternative No. 1 is the lowest cost option, it is not effective. As such, Alternative No. 1 is ranked as low for cost effectiveness and protectiveness.

Alternative No. 2 is the alternative with the highest cost due to the soil disposal volume. It has the potential to protect potential Site occupants from Site contaminants through the removal of source material. This translates into the removal of approximately 64,500 cubic yards of impacted soils above Unrestricted Use SCOs. Based on a conversation factor of 1.7 tons per cubic yard, this equates to approximately as much as 110,000 tons of impacted soil requiring removal and disposal at a permitted facility at an estimated all-inclusive unit price of $120 to $150 per ton. Replacement would entail two (2) feet of clean soil across the 20-acre removal zone (~64,500 cubic yards of clean fill). Due to the technical difficulties associated with site conditions, Alternative No. 2 is not easily implementable. As such, Alternative No. 2 is ranked as low for cost effectiveness and protectiveness.

Alternative No. 3 is less costly than Alternative No. 2 as the cost of limited soil removal and cover system and other associated engineering controls will likely be significantly less. Alternative 3 would protect potential Site users from Site contaminants by limited excavation, placement of a surface cover system, and the implementation of institutional controls and maintenance of engineering controls codified in a SMP. Alternative No. 3 can be implemented employing common engineering, reliable industry standards and construction practices. Much of the remedy can be implemented during normal construction activities. As such, Alternative No. 3 is ranked as high for cost effectiveness and protectiveness. Based on the above evaluation, Alternative No. 3 is the most cost effective, protective remedy for the Site.

4.7 Sustainability / Green Remediation Concepts Analysis

The process of assessing remedial alternatives for sites managed under the NYS BCP applies selection criteria set forth in 6 NYCRR Part 375-1.8(f). An evaluation of each alternative against these criteria was presented in

s 4.1 to 4.6 of this RAWP. To further assist Applicants in determining which alternatives would provide the greatest net benefit to the environment, the NYSDEC published DER-31 / Green Remediation Policy (DER-31), dated January 20, 2011. DER-31 introduces a holistic approach to managing sites within the remedial program in the context of the larger environment, a concept known as green remediation. The main goal of this initiative is to promote the use of sustainable remediation practices and technologies that minimize the environmental footprint of a potential remedy while still protecting public health and the environment.

By identifying ancillary environmental impacts for each proposed remedial alternative including but not limited to:

- Long-term environmental impacts of treatment technologies;
- Pollutant emissions including greenhouse gases (GHFs);
- Energy efficiency;
- Conservation of resources and materials;
- Generated waste versus reuse and recycling;
- Habitat value (maintaining or creating new habitat);
- Fostering green and healthy communities and landscapes that balance ecological, economic and social goals; and,
- Green sustainable re-development.

Proposed remediation alternatives will be further assessed based on the number of green remediation techniques incorporated within each alternative. These techniques are considered easy to implement at a money saving or negligible cost. Some examples of these techniques include:

- Use of renewable energy and/or purchase of renewable energy credits (RECs) to offset energy demand;
- Reduce vehicle idling;
- Cover systems designed for alternative uses: habitat, recreation, minimal maintenance, stormwater infiltration;
- Beneficial reuse of materials (e.g. crushed clean concrete as base or fill), and;
- Use of Ultra Low Sulfur Diesel (ULSD) fuel.

Each remedial alternative is assessed based on all environmental effects of remedy implementation. Impacts and benefits implicit in each alternative are ranked as Poor, Fair, Good, or Very Good in terms of supporting a "Green Remedy". Non-applicable criteria are indicated with NA. Alternatives proposed:

- Alternative 1: No Action
- Alternative 2: Excavation to Unrestricted Use SCOs
- Alternative 3: Limited Excavation, Surface Cover Installation, Institutional and Engineering Controls, and Monitored Natural Attenuation of Groundwater Impacts

Sustainability / Green Remedial Alternative Analysis			
Evaluation Criteria	**Alternative No. 1**	**Alternative No. 2**	**Alternative No. 3**
Ancillary Environmental Impacts			
Long-term environmental impacts of treatment technologies	NA	Poor	Very Good
Pollutants emissions including greenhouse gases (GHFs)	Very Good	Poor	Good
Energy efficiency/usage	Very Good	Poor	Good
Conservation of resources and materials	Very Good	Poor	Good
Generated waste versus reuse and recycling	Very Good	Poor	Good
Habitat value (maintaining or creating new habitat)	Very Good	Fair	Fair
Fostering green and healthy communities and landscapes that balance ecological, economic and social goals; and	Poor	Good	Very Good
Green sustainable re-development	Poor	Very Good	Very Good
Environmental Benefits: Number of Green Remediation Techniques Incorporated			
Use of renewable energy and/or purchase of renewable energy credits (RECs) to offset energy demand	Poor	Poor	Very Good
Reduction of vehicle idling	NA	Poor	Good

Sustainability / Green Remedial Alternative Analysis			
Evaluation Criteria	**Alternative No. 1**	**Alternative No. 2**	**Alternative No. 3**
Cover systems designed for alternative uses: habitat, recreation, minimal maintenance, stormwater infiltration	Poor	Good	Very Good
Beneficial reuse of materials (e.g. crushed clean concrete as base or fill	Poor	Very Good	Very Good
Use of Ultra Low Sulfur Diesel (ULSD) fuel	NA	Good	Very Good

4.7.1 Alternative 1 Sustainability / Green Remedial Alternative Assessment

In consideration of ancillary environmental impacts, Alternative 1 is consistently ranked Very Good in: pollutant emissions, energy efficiency, resource conservation, and waste generation due to the lack of heavy machinery usage required for excavation and disposal of contaminated soil. It is ranked Poor for fostering green and healthy communities and green re-development, as the on-site contamination would remain in place, preventing redevelopment and community use of the Site.

In consideration of the environmental benefits / number of green remediation techniques incorporated; Alternative 1 is consistently ranked Poor since it does not incorporate any of these initiatives and does not provide an effective cover system protective of human health.

4.7.2 Alternative 2 Sustainability / Green Remedial Alternative Assessment

In consideration of ancillary environmental impacts, Alternative 2 is consistently ranked Poor in: long-term environmental impacts of treatment technologies, pollutant emissions, energy efficiency, resource conservation, and waste generation. This is due to the significant amount of energy for machinery usage required to excavate contaminated materials from the site and transport to a treatment, storage and disposal facility (TSDF). Alternative 2 ranks Fair in creation of habitat value since soil contamination would be removed, but at the cost of almost half of the existing habitat due to the proposed building and parking lot footprint. It is ranked good in fostering a green and healthy community since it offers ecological incentive, but at a large economic cost given the large volume of

excavated soil disposed of on a per ton cost basis. It ranks Very Good in Green re-development since no contamination would remain to limit redevelopment.

In consideration of the environmental benefits / number of green remediation techniques incorporated, Alternative 2 is mixed. A significant number of RECs would require purchase to offset the large amount of energy (fuel) required for machinery needed to excavate contaminated material from the site and transport to a TSDF. All heavy machinery (excavators and trucks) would generate a significant amount of exhaust emissions, including idling while cuing for load-out, though ULSD would presumably be used in all equipment. This alternative would require the largest importation of clean material, so potential beneficial reuse of materials (e.g. imported clean crushed concrete) could be significant, if such material is used.

4.7.3 Alternative 3 Sustainability / Green Remedial Alternative Assessment

In consideration of ancillary environmental impacts, Alternative 3 is consistently ranked Good. The long-term environmental impacts of treatment technologies is low due to reduced excavation volume, requiring significantly less energy than Alternative 2, producing less waste and less emissions. The placement of the impermeable layer (and associated clean soil cover) within areas of exposed soil would result in fostering a green landscape and adding potential habitat value. This alternative facilitates re-development of the Site.

In consideration of the number of green remediation techniques incorporated, Alternative 3 is ranked Good. Less RECs would require purchase to offset the reduced amount of energy usage (fuel) by machinery required to excavate from the site and transport to a TSDF a smaller quantity of soil than Alternative 2. Heavy machinery (excavators and trucks) would generate a reduced volume of exhaust emissions than Alternative 2. Importation of clean fill material, building, parking area and stormwater impoundments will provide opportunities for beneficial reuse of materials (e.g., reuse of clean crushed concrete, etc.), if such material is used, which Alternative 1 does not provide.

4.7.4 Sustainability / Green Remedial Alternative Comparative Analysis

Alternative 3 has the lowest ancillary environmental impacts of all three (3) alternatives, providing a balance between the economics of providing a tailored remediation while

providing a green sustainable re-development of the Site. Alternative 3 also allows for inclusion of all green remediation techniques. The cover system also provides exposure protection for site occupants while allowing for the potential natural attenuation of soil and groundwater contaminants. Alternative 3 is the preferred alternative based on this sustainability green remedial comparative analysis.

5.0 REMEDIAL ACTION APPROACH

5.1 General

The proposed remedy for the Site is based on the planned future Commercial Use incorporating Engineering and Institutional Controls consistent with 6 NYCRR Part 375 Track 4 Cleanup Track as promulgated at 6 NYCRR 375-3.8(e)(4).

The Site is anticipated to be redeveloped as an Emergency Call Center for Ulster County and, potentially, a large-scale solar facility in the future. The development of these two (2) uses is anticipated to occur in phases with the Emergency Call Center as the initial development effort. The Emergency Call Center will be located in the northern and central portion of the Site, while the solar facility is anticipated to be located throughout the remaining vacant areas of the Site. The redevelopment of the Site as a solar facility would occur following the completion of the Emergency Call Center. The construction of the proposed solar facility, or any other future development, will be governed by the Site Management Plan (SMP) for Site (see Section 13.1) and is not specifically addressed under this RAWP, except as applicable and warranted (e.g., soil cover systems). The Applicant will contact the NYSDEC Project Manager prior to any proposed construction related to a future development after the completion of the Emergency Call Center to provide detailed information on the development, and implement the construction is accordance with the SMP.

The Site Plan for the Emergency Call Center is provided as Exhibit A.

The specific elements of the selected remedy are as follows:

- Sample (as warranted), manage, segregate, and dispose off-Site surface materials (i.e., stumps, brush, incidental C&D materials and debris);

- Remove and dispose of a ~550-gallon underground fuel oil storage tank (associated Spill Number 14-01829), including contents and appurtenances, and any adjacent soil impacted with petroleum contaminants above Commercial Use SCOs;

- Removal and off-site disposal of at least ten to twelve ~55 gallon containers located in the south-central portion of the Site. The approximate location of the

unidentified containers is shown on Figure 6 – *Extent of Contamination in Soils and Drum Carcas Area*. This drum carcass refuse pile was identified during the 2023 supplemental remedial investigation. The remedy will include limited excavation and off-site disposal of soils underneath and surrounding the containers. Confirmatory post-excavation sampling will be performed of these areas to determine clean soil endpoints as described in Sections 9.1 and 9.2;

- Perform limited excavation and off-site disposal of soil at three (3) locations MW3-TPN2, MW3-TPE2, and MW6-TPW1 where the soil dieldrin concentrations exceed the PGW SCO, and where dieldrin was detected in associated groundwater samples from nearby monitoring wells (MW-03 and MW-06). The cleanup criteria for this limited excavation will be to meet PGW SCO for dieldrin at this location;

- Perform limited excavation and stockpiling or direct load-out of soils (if warranted) as required by construction, that are located within known areas of heavy metals/dieldrin contamination. Excavated soils in these areas, if suitable for construction purposes, could be relocated on-site under the Surface Cover System (see below).

- Perform limited excavation(s) as required for construction and dispose and/or relocate soils that are located outside of known contaminated areas, but are not suitable for construction purposes;
- Characterize through sampling and analysis stockpiled soil (if warranted) as required for off-site waste disposal purposes;
- Contain and treat or sample and dispose of off-Site impacted groundwater encountered during construction that may be generated from dewatering activities associated with remediation and/or construction;

- Install a barrier demarcation layer to define the boundary between clean backfill and contaminated soils where applicable;

- Place Engineering Controls in the form of a surface cover system, inclusive of building foundation and slab, pavement and clean fill soils meeting applicable SCOs where required;

- Conduct environmental monitoring, including sampling of groundwater and inspection of Engineering Controls, as required to monitor the effectiveness of the remedy and use restrictions/limitations to prevent exposure to remaining contaminants; and,
- Establish Institutional Controls in the form of an environmental easement restricting future land use and groundwater use and requiring periodic inspection of the Engineering Controls for the Site.

Refer to Figure 4 – *Remedial Action Implementation Plan and Details.*

5.1.1 Remedial Action Implementation

The following sections provide the conceptual detail for the Site's proposed remedial action. Remedial action will be coordinated with site construction activities once a proposed construction plan is developed and adopted.

5.1.1.1 Site Clearing and Grubbing

Areas with No Exceedances of Commercial Use SCOs

Prior to site clearing and grubbing, areas of the Site will be identified in the field with visible stakes and/or other markings to delineate areas where exceedances above Commercial SCOs were not identified during the RI (mainly north and northwestern portions of the Site). These areas will be deemed not contaminated. Soil disturbances in these areas (not contaminated areas), inclusive of clearing and grubbing, will be managed and limited to avoid cross contamination between contaminated and not contaminated areas. Decontamination procedures outlined in Section 6.3 will be followed when working across areas.

Alternatively, due to the complexity of managing soils across the Site, soil movement will be performed in these areas limiting cross contamination to the extent practical and subsequent sampling in these areas (see Section 9.2) will be conducted to determine whether these areas have contaminants at concentrations above Commercial Use SCOs and whether a surface cover system is needed in these areas.

Wetlands Vicinity

Clearing and grubbing in the vicinity of wetland areas will be limited to the central portion of the Site for soil remediation purposes and the construction of the gravel emergency access road connecting to South Ohioville Road (see Section 5.1.1.1 and Section 5.3). Prior to site clearing and grubbing in the vicinity of the wetlands, wetlands and their respective buffer zones will be identified in the field with visible stakes and/or other markings. Erosion and Sediment Control (E&SC) measures, as specified in the site-specific Stormwater Pollution Prevention Plan (SWPPP, see Section 10.2) will be installed prior to site clearing and grubbing.

Remaining Portions of the Site to be Developed

Existing Site vegetation and trees will be cleared and grubbed prior to construction. Vegetation situated at and/or above the ground surface will be cleared and disposed of off-Site at an approved disposal facility. Vegetation situated below the ground surface (i.e. roots) will be removed and the vegetation vigorously shaken and rolled over the ground surface to dislodge bulk soils clinging to the vegetation. Alternate means of handling and disposing of cleared/grubbed vegetation and trees will be reviewed and approved by the NYSDEC Project Manager and the Remediation Engineer (see Section 1.2 for definition).

5.1.1.2 Monitoring Well Decommissioning

Site groundwater monitoring wells will be decommissioned as needed where conflicting with proposed construction, in accordance with the procedures outlined in DEC CP-43 Commissioner's Policy on Groundwater Monitoring Well Decommissioning. There are 11 groundwater monitoring wells, the locations of which are shown on Figure 4 – *Remedial Action Implementation Plan and Details*. If possible and practical, at least nine (9) monitoring wells will be protected for the duration of the project, preserved for groundwater monitoring following remediation. A final determination on these pre-existing wells or future new wells will be made in consultation with the NYSDEC Project Manager.

A system of shallow and bedrock pumping test wells exists throughout the Site. The locations of all pumping test wells will be determined prior to any Site earthwork. Prior to initiation of site work, these wells will be clearly marked and sufficiently protected as necessary to prevent any damage for the duration of the project. The Remediation

Engineer (see Section 1.2 for definition) must be notified if any of these wells conflict with the proposed site development. If wells are found to conflict with proposed work, these wells shall be decommissioned in accordance with the procedures outlined in DEC CP-43, once authorized by the Owner and approved by the Remediation Engineer.

5.1.1.3 Closure of Bulk Storage Tank

One (1) known UST is located within the northeast quadrant of the site (refer to Figure 4 – *Remedial Action Implementation Plan and Details*). The UST is located beneath approximately two (2) feet of soil. Information in the Phase II Environmental Site Assessment by DT Consulting Services, Inc. (2014) states that the UST has an estimated capacity of 550-gallons and as of 2014, contained approximately 21-inches of liquid described as "mainly water with a slight petroleum odor". NYSDEC Spill Number 14-01829 was opened due to the discovery of this tank.

The following general procedures will be followed for closure by removal of the known bulk storage tank and any other tanks that may be encountered during the remedial action or construction.

- Notify NYSDEC of closure activities via a "Pre-Work Notification for Bulk Storage (PBS or CBS) Tank Installation or Closure" form (if warranted).
- Closure of the tank and associated appurtenances (product, fill and vent piping, etc.) shall conform to applicable sections of DER-10, NYSDEC Petroleum Bulk Storage regulations 6 NYCRR Part 613-2.6, and Out-of-service UST Systems and Closure
- Any soil, fill, concrete and/or asphalt overlying and/or surrounding the tank or appurtenances will be removed to allow access.
- The waste contents of the tank/appurtenances, and cleaning wastes (oil-soaked rags, absorbent material, polyethylene (poly) sheeting and soiled personal protective equipment will be properly managed and disposed of off-site at an approved and permitted TSDF. The wastes will be transported by a 6 NYCRR Part 364 permitted carrier and disposed of at a facility permitted to accept the waste. Should out-of-state facilities be identified as proposed disposal facilities, permits for the facilities by the corresponding regulatory agency shall be provided to the Remediation Engineer for review and approval prior to removal of waste from the Site. The disposal facility and general type of waste must be specifically listed on

the transporter's permit. If in small quantities, this waste may be temporarily stored in labeled DOT approved 55-gallon drums for disposal at a permitted and approved treatment, storage and disposal facility (TSDF).

- The tank will be accessed either through tank manways (if present) or a hole will be cut in the tank to allow access for removal of the tank contents and cleaning while the tank remains in-place. Poly sheeting will be placed on the ground adjacent to the tank openings to mitigate contamination of the ground surface when cleaning the tank interiors. Prior to opening, cutting, or entering the tanks for cleaning, the Contractor shall assess and document the atmospheric conditions within the tanks. The Contractor shall follow confined space entry procedures in accordance with 29 CFR Part 1910.146 for tank cleaning by appropriately trained personnel.
- The tank will be cleaned and purged of any vapors in accordance with all applicable regulations in addition to 29 CFR Part 1910.146. The tank will be rendered unusable on-site by cutting a hole in the end of the tank after removal from the ground and/or vault, if not already done so for access. The tank, distribution and vent piping, and associated equipment will be properly disposed of off-site at a steel recycling facility. Records of metal disposal/recycling shall be provided to the Remediation Engineer.
- Confirmatory soil samples will be collected for laboratory analyses after removal of the tanks, as described in Section 9.1.
- Clean, pre-approved imported fill as described in detail in Section 9.4 will be used to backfill the tank grave excavation area. Fill material will be placed in the excavation in 12-inch lifts compacted to grade. A barrier demarcation layer will be installed prior to backfill.

No portion of tank closure activities shall be performed by the Contractor without direct oversight of Remediation Engineer personnel. Documentation of tank closure activities will be included in the Final Engineering Report (FER).

5.1.1.4 Remediation of Impacted Fill/Soil

The following general procedures will be followed for the remediation of impacted soil mantling the Site, depending on location of the contaminated soil and the proposed work. Upon preparation of the detailed Site Plan, the Remediation Engineer will prepare

Engineering Drawings indicating areas anticipated for excavation and off-site disposal, and excavation and on-site relocation, based on the cut and fill plan prepared by the Site Plan Engineer. The Site Drawing will be reviewed and approved by NYSDEC prior to implementation.

The contaminants of concern (COCs) in soils throughout the majority of the Site are pesticides and heavy metals at concentrations exceeding Commercial Use SCOs, Protection of Groundwater SCOs (dieldrin only) and Protection of Ecological Resources. Exceedances of SCOs above Protection of Ecological Resources exist in areas within the site border that are adjacent to the wetlands. It is noted that areas adjacent to wetlands, are not included within the BCP boundaries. In some areas this contamination is limited to the upper one (1) foot of soil, and in other areas this contamination is from the surface to approximately four (4) feet bgs. Refer to Figures 2A – *Map of Fill/Surface Soil Exceeding SCGs*, 2B - *Map of Fill/Subsurface Soil Exceeding SCGs*, and 2C – *Map of Fill/Test Pit Soils Exceeding SCGs* and Figure 3 – *Map of Groundwater Exceeding SCGs.*

With the exception of dieldrin, the contaminants of concern do not appear to be mobile and are not present in groundwater. Procedures for excavation of contaminated soil to facilitate construction, or placement of a cover system above contaminated soil that will remain in place, will vary by area, dependent upon the location and proposed work scope.

In areas where structures will be constructed that cover surface soil, such as building structures, concrete walkways, asphalt paving, imported gravel roadway, reinforced turf, etc., a surface cover system is not required. Wherever such structures are not proposed, a surface cover system shall be placed in accordance with Section 5.1.1.7. Furthermore, a surface cover system will not be warranted in non-contaminated areas, based on the RI data (mainly north and northwestern portions of the Site), pending confirmatory sampling.

These remedial procedures are determined by proposed work as follows:

Contaminated Soil identified at locations MW3-TPN2, MW3-TPE2, and MW6-TPW1: Excavate soil from the surface to three (3) feet below grade at all three (3) locations for the entire area shown on Figure 4 – *Remedial Action Implementation Plan and Details*. Erect temporary construction fence around the proposed excavation area to prevent unauthorized access, pending end-point sampling and backfilling. The soil will be

removed in "lifts" with sampling performed at the base of each lift. If the lab results indicate that dieldrin does not exceed the Protection of Groundwater SCOs, the excavation will be terminated. Excavation will continue until the soil meets the applicable SCOs.

Post-remediation samples will be collected in accordance with Section 9.2. Upon receipt of acceptable end-point sample results, and concurrence with NSYDEC, these areas will be backfilled with clean fill (per Section 9.4) to existing grade and/or with on-site soils meeting applicable SCOs, upon consultation with NYSDEC.

Any encountered concrete from building remains (or otherwise) in contact with fill/soil requiring remediation will either be broken up and disposed of with the impacted fill/soil and/or the impacted fill/soil will be removed from the concrete and disposed of as a separate C&D waste stream. The proposed disposal locations for both waste streams will be submitted to the certifying Remediation Engineer and NYSDEC Project Manager for approval prior to removal from the Site.

Other appurtenances that may be in contact with contaminated Site fill/soil include, but are not limited to, concrete slabs or footings, concrete structures of any kind, and underground utilities. These appurtenances, and any other appurtenances encountered within the remedial excavation, will be disposed of as a separate C&D waste stream provided that any fill/soil adhering to the appurtenances are removed prior to the appurtenances leaving the Site for off-site disposal. The disposal location(s) will be submitted to the certifying Remediation Engineer and NYSDEC Project Manager for approval prior to removal of these materials from the Site.

Confirmatory post-excavation end-point samples will be collected for laboratory analysis in accordance with Section 9.2 where required to confirm removal of contaminated soils.

Contaminated Soil Excavated for Construction Where Above-Grade Structure or Hardscape Feature is Proposed as Part of Site Development (No Soil Cover Required): Excavate soil as required to complete construction of surface structure, segregating and stockpiling soil excavated from contaminated areas and depth intervals as identified in:

Figures 2A – *Map of Fill/Surface Soil Exceeding SCGs*, 2B - *Map of Fill/Subsurface Soil Exceeding SCGs*, and 2C – *Map of Fill/Test Pit Soils Exceeding SCGs.*

Re-use excavated soil on-site as fill beneath a suitable surface cover system if re-use has been approved by the NYSDEC, or dispose of soil off-site at an approved waste disposal facility.

Contaminated Soil Located Where No Above-Grade Structure or Hardscape Feature is Proposed as Part of Site Development (Soil Cover Required): Excavation in these areas might be warranted depending upon the proposed Site Plan, proposed cut and fill areas and requirements of the Surface Cover System (i.e. one foot of soil with NYSDEC-approved backfill). A surface cover system will be installed in accordance with Section 5.1.1.7 to cover the area(s) of soil contamination where no excavation or surface structure is proposed.

Non-Contaminated Soil in the North and Northwestern Portions of the Site (No Soil Cover Required Pending Confirmatory Sampling): Excavation in these areas might be warranted depending upon the proposed Site Plan and proposed cut and fill areas. Soils will be managed to prevent cross contamination between contaminated and not contaminated areas as described in Section 5.1.1.1 and Section 6.3. A surface cover system is not required in these areas pending confirmatory sampling and/or soil management practice selected (See Section 5.1.1.1). Soils in these areas will be tested following the excavation of contaminated soils in other areas of the Site and prior to the Site Grading and Surveying outlined in Section 5.1.1.6 to confirm these areas do not warrant a soil cover system (see Section 9.2). Following testing, if soils do not meet Commercial SCOs, these soils will be handled as contaminated soils, and the placement of a surface system will be required.

The use of existing on-Site material will be evaluated for use as backfill from an environmental standpoint by the Remediation Engineer, in consultation with NYSDEC. The use of existing on-Site material will be evaluated for use as backfill from a construction suitability standpoint by the appropriate engineer with such expertise (Site Plan Engineer, Structural Engineer, etc.). If the use of on-Site material is not suitable, clean suitable construction grade fill will be imported to make appropriate grades, minus the required thickness of the soil cover system.

5.1.1.5 Groundwater Evacuation and Treatment

The COCs in groundwater within portions of the Site include pesticides and heavy metals (iron, lead and manganese). Groundwater was measured from approximately 1.4 to 7.4 feet bgs across the Site.

Groundwater will likely be encountered during excavation at depths greater than about four to eight feet in general. The following general procedures will be followed for groundwater evacuation and treatment during the remedial action and construction.

- Groundwater entering the excavations will be evacuated and transferred into a temporary holding tank to the extent necessary to remove impacted soils or perform required construction. If limited in volume, the groundwater may be evacuated from the excavations as necessary via a vacuum (Vac) truck and transported for off-site disposal at an approved and permitted TSDF. The disposal facility permits will be submitted to the certifying Remediation Engineer and NYSDEC Project Manager for approval prior to removal from the Site.
- If on-site discharge of dewatering effluent is proposed by the Contractor (on-site discharge location to be determined), on-site groundwater treatment will be implemented for all dewatering fluid unless laboratory testing has demonstrated that groundwater contaminant concentrations meet effluent discharge limits, and if on-site discharge is approved by the Remediation Engineer and acceptable to the NYSDEC.

The Contractor shall be responsible for obtaining all required permits and performing all effluent treatment and testing to discharge dewatering effluent on-site. The Remediation Contractor shall provide the Remediation Engineer with the dewatering treatment system design and work plan for approval prior to implementation.

5.1.1.6 Site Grading and Surveying

Prior to the placement of the surface cover system, a Professional Surveyor licensed to practice in New York State (NYS) will survey the Site to establish elevation before the surface cover system is installed. The purpose of the survey will be to establish survey points for preparing as-built drawings showing the elevations where existing soils will be encountered during future Site development and/or disturbances. The same survey points will be utilized to record the elevation after placement of the surface cover system to document the required surface cover system thickness was achieved. The frequency

of survey data points will be no less than a 30 by 30-foot grid across the Site but may require more survey points on critical slopes or other variable topography.

5.1.1.7 Surface Cover System

The surface cover system (Engineering Control) will consist of the following:

- Imported clean fill, as defined in Section 9.4, of a minimum 12-inch thickness installed over a demarcation layer;
- Building structure(s) with a concrete foundation or slab;
- Asphalt (i.e., parking lot and driveways of future construction) generally 8 inches thick;
- Poured in-place concrete (i.e., sidewalks and utility foundations of future construction) generally 10 inches thick in aggregate (e.g., 6-inches of clean, compacted sub-base under 4-inches of concrete);

Refer to Figure 5 - *Surface Cover Details* for depictions of typical surface cover system design criteria.

A Surface Cover System might be warranted in the wetland buffer areas. The Town of New Paltz Planning Board will likewise need to approve placement of the Soil Cover system within wetland buffer zones (if warranted). The Contractor shall provide to the Town for review, design details of mitigation measures that will be employed during placement of the Surface Cover System up to the leading edges of the adjacent wetlands.

Per 6 NYCRR Part 375 375-6.7 (d) (1) (ii) (b), the soil imported to serve as the surface cover system in areas of exposed soils or as backfill within the Site (except in wetland buffer zones) must not exceed the lower of the protection of groundwater or the protection of public health soil cleanup objectives, for the identified use of the site as set forth in Table 375-6.8(b) of 6 NYCRR Part 375-6.8, unless otherwise described herein. The intended use of the Site is Commercial Use. Soils to be used as the surface cover system in wetland buffer zones (see below) must not exceed the lower of the protection of ecological resources as set forth in Table 375-6.8(b) of 6 NYCRR Part 375-6.8. Table 375-6.8(b) is included as Appendix B.

Prior to placement of the surface cover system utilizing imported fill (12 inches minimum), a demarcation layer (i.e., woven or non-woven filter fabric, or other material that is approved by the Remediation Engineer and NYSDEC) will be installed over

existing soils to serve as a visual barrier between the bottom of the surface cover soil system and top of the existing soils where necessary. No demarcation layer or 12 inches of NYSDEC-approved fill will be placed in areas where building(s), parking areas, stormwater structures (i.e., stormwater basin), or hardscapes are proposed to be constructed, unless directed by the NYSDEC.

All fill and topsoil imported onto the Site for placement for the surface cover system will require analytical testing as promulgated in Section 5.4(e) of DER-10 and Section 9.4.

The Remedial Design Document will include a figure depicting the planned zones of the soil cover remedy as outlined herein.

5.1.1.8 Post-Remedial Action Groundwater Monitoring and/or Treatment

Site investigations document that the COC for portions of Site groundwater is primarily dieldrin (MW-3 and MW-6). Elevated concentrations of iron and manganese, typically naturally occurring metals, were also detected. An elevated concentration of lead was detected in MW-02. PFOA and PFOS were detected in MW-10 above guidance values. PFOA was detected in MW-02 above guidance values.

The remedial action will be implemented, which will include excavation and off-site disposal of dieldrin impacted surface soil around locations MW3-TPN2, MW3-TPE2, and MW6-TPW1, where dieldrin was detected in groundwater above GA Standards. End-point sampling will be performed following excavation, and upon receipt of end-point sample results which are below Commercial SCOs and Protection of Groundwater SCOs for dieldrin, the excavations will be backfilled with NYSDEC-approved backfill. Per 6 NYCRR Part 375 375-6.7 (d) (1) (ii) (b), the soil imported to serve as backfill must not exceed the lower of the protection of groundwater or the protection of public health soil cleanup objectives, for the identified use of the site as set forth in Table 375-6.8(b) of 6 NYCRR Part 375-6.8. The intended use of the Site is Commercial Use. Table 375-6.8(b) is included as Appendix B.

Monitoring wells to be removed/decommissioned during the remedial action will be replaced in-kind (same construction type and relative general location), unless permission is granted by NYSDEC to waive the replacement of wells. Monitoring wells to be replaced (if warranted) will be determined following remedial activities with approval of NYSDEC. The monitoring wells will be installed, developed, purged, and

sampled in accordance with the Field Sampling Plan (FSP) in the Remedial Investigation Work Plan (RIWP). The groundwater samples will be analyzed for pesticides and Target Analyte List (TAL) metals. At least one (1) post-remediation groundwater sampling event is anticipated following excavation. A determination pertaining to subsequent post-remediation groundwater sampling after the initial event will be determined in consultation with NYSDEC.

The pre- and post-remedial action groundwater sampling results will be reviewed by the Remediation Engineer and the Department to gauge the effectiveness of the remedial action on groundwater quality. As a "Volunteer" in the BCP, Ulster County will be responsible for remedial activities related to on-site groundwater quality specific to on-site contamination and contamination that may be migrating on site from an upgradient source.

Future development of the Site will include connection of the property to the Town of New Paltz municipal potable water system. At this time, the use of on-site groundwater for potable water purposes is not proposed. In the event of a future installation of a potable water well(s) is proposed, an Institutional Control enforced through a deed restriction or environmental easement, will mandate Site groundwater use restrictions, which include installation and maintenance of a potable water treatment system sufficient to remove contaminants including but not limited to pesticides, heavy metals, and emerging contaminants including PFOA, PFOS, and 1,4-dioxane to concentrations below applicable standards.

5.2 Remedial Action Objectives

Table 3.2-1, Section 3.2 summarizes the Contaminants of Concern (COCs) within each medium and the remedial action objectives (RAOs) identified for each medium.

5.3 USACOE Jurisdictional Determination and Protection of Adjacent Wetlands

The BCP Site, which encompasses approximately 36.0 acres of the 57.3 acres comprised of two (2) tax parcels combined, does not contain federal, state, or local wetlands. Wetlands are located outside and adjacent to the BCP Site boundaries. According to a Jurisdictional Wetland Determination by the U.S. Army Corps of Engineers (USACOE) dated February 27, 2015 there are seven (7) wetlands, totaling 10.89 acres. The

Jurisdictional Wetland Determination, along with a Wetland Delineation Report prepared by Robert Torgersen Landscape Architect (inclusive of a A.C.O.E. Wetland Delineation Map), dated October 12, 2014, used as the basis of the determination is presented as Exhibit 2.

All the wetlands are designated Town of New Paltz wetlands, and 9.67 acres are federal jurisdictional wetlands. There are no mapped NYSDEC wetlands on Site. Fifty-to-one-hundred-foot buffer zones were also identified around these wetlands depending on the function and size of each wetland. Per the Town of New Paltz regulations, wetlands greater than 1/10 acre but smaller than one acre have an associated buffer area of 50 feet, while wetlands equal to or greater than one acre have an associated buffer area of 100 feet.

The proposed development includes the construction of a gravel emergency access road connecting to South Ohioville Road potentially impacting wetlands outside the BCP boundary. Refer to Exhibit 1 –*Site Plan*. The proposed project will undergo an environmental impact evaluation as part of the Site Plan Approval and State Environmental Quality Review (SEQR) process. At that time the impacts of the existing proposed development will be evaluated, and mitigation strategies, if needed, will be developed based on the magnitude of the impacts.

It is anticipated that the remediation of contaminated soil proposed in Section 5.1.1.4 (excavation and off-site disposal of contaminated soil) will likely reduce the likelihood of migration of contamination into the wetlands. As stated in the Wetland Delineation Report, "All on-site wetlands seem to be fed by groundwater as there are no streams entering the site and very little contributing watershed off-site". Removing the source of dieldrin contamination (via soil hot spot removal) will improve groundwater quality, likely resulting in the prevention of dieldrin contamination migrating into the adjacent wetland(s).

The scope of wetland mitigation under this RAWP as it pertains to contamination migration is limited to the control and prevention of erosion and sediment control of potentially contaminated soils. No active remediation in the wetlands related to on-site contamination is proposed. A site-specific Stormwater Pollution Prevention Plan (SWPPP) will include requirements for erosion and sediment control measures to prevent the migration of potentially contaminated soils. The Contractor will be responsible for

implementing the SWPPP. If soil migration is apparent, improvements to the erosion and sediment control measures will be required and implemented, and the Contractor shall be responsible for remediating soils migrating off-site into the wetlands, inclusive of chemical testing to determine potential impacts.

At a minimum, the proposed project will likely require the following permits:

- A USACOE permit. Covered under Nationwide Permit #39 in accordance with Section 404 of the Clean Water Act. A pre-construction notification to USACOE is required.
- A permit from the Town of New Paltz, in accordance with Town Code Chapter 139 for the proposed wetland and buffer zone disturbances. The Town of New Paltz Planning Board will likewise need to approve placement of the Soil Cover system within wetland buffer zones (if warranted). The Contractor shall provide to the Town for review, design details of mitigation measures that will be employed during placement of the Surface Cover System up to the leading edges of the adjacent wetlands.

Permit(s) and mitigations measures pertaining to erosion and sediment controls will be provided to the Remediation Engineer for incorporation into the Final Engineering Report (FER).

The Contractor is responsible for complying with all local, state, and federal wetland regulations, including obtaining all required permits and performing all required work notifications.

5.4 Applicable NYS Standards, Criteria and Guidance (SCGs)

The anticipated use for the Site is "Commercial Use". The applicable SCGs for each media are presented in Section 3.2 of the RAWP.

5.5 Remedial Action Schedule

It is expected that Site development project field work will be completed in calendar year 2025. In order to meet this construction schedule, the following schedule is proposed.

- Submit RAWP to NYSDEC for review by February 2024.

- Obtain general acceptance of document for public review by September 2024.
- 45-Day Public Comment Period until October 2024 which includes NYSDEC preparation of Decision Document and Fact Sheet.
- NYSDEC issues Decision Document and remedy may begin on or about November/December, 2024.
- Preparation of a design document that outlines remedial aspects within the RAWP, which are dependent upon the final site development plans by November/December 2024.
- Conduct site development work (mostly subgrade work and surface work like slabs, sidewalks, etc.) from February to July 2025.
- Submit completed draft Environmental Easement by August 2025.
- Execute Environmental Easement by September 2025.
- Submit draft Site Management Plan by August 2025.
- Submit draft Final Engineering Report by September 2025.
- Submit final Site Management Plan by October 2025 or some other agreed upon date that is pre-approved by the Department.
- Submit Final Engineering Report by November 2025 or some other agreed upon date that is pre-approved by the Department.

5.6 Public Participation

Public participation for the Site has been periodically conducted as part of the BCP. Public participation will continue on this project with a public comment period, placing documents in the repository and issuing a notice/fact sheets, as follows:

- Once approved by the NYSDEC, place this RAWP in the document repositories prior to the public comment period. This document will be preliminarily reviewed by NYSDEC for general acceptance, then a more formal review will be performed

by NYSDEC during the comment period; providing comments before the documents are made final.

- Issue a notice for the start of a 45-day public comment period for this RAWP.
- Issue a public notice/fact sheet for the start of remedial/construction work.

NYSDEC approval of this RAWP will follow the public comment period unless a public meeting is requested and deemed necessary by NYSDEC. If needed, a public meeting will be held toward the end of the 45-day comment period to explain the project in further detail, answer public questions and hear public comments.

5.7 Soil Vapor Intrusion Evaluation

A soil vapor intrusion (SVI) evaluation is not proposed at this time as chlorinated solvents were not detected above applicable SCGs in soil and groundwater samples collected during the RI. In the event an SVI is deemed necessary by the NYSDEC and NYSDOH, it should be performed in accordance with the protocol outlined below.

An SVI evaluation will be completed prior to the submission of the Final Engineering Report (FER) and building occupancy. The SVI evaluation will include an assessment of pre- and post-remediation soil data, pre-remediation groundwater data, evaluation of the effectiveness of the remedial action relative to SVI, and evaluation of the on-site building relative to SVI. The need for soil gas, sub-slab soil vapor and indoor/outdoor air quality samples will be evaluated during completion of the SVI evaluation. Based on past investigations at the Site, no active vapor intrusion mitigation measures are anticipated at the Site.

Should sampling be requested by NYSDEC and NYSDOH, a work plan will be developed in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006 for NYSDEC and NYSDOH approval prior to sampling. The work plan will describe, at a minimum, sampling locations and procedures, equipment to be used, procedures for validating adequate seal at the soil vapor sampling location, and length of sampling period. The sampling event will include testing for volatile organic compounds for TO-15 Selected Ion Monitoring (SIM) list at three (3) locations within the proposed building footprint, and the corresponding ambient air samples.

5.8 Monitored Natural Attenuation

Except as aforementioned, groundwater is not generally impacted at the Site. No groundwater treatment is proposed. Groundwater monitoring activities to assess natural attenuation will be conducted post-remediation and Site development, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level over an extended period. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional treatment and/or control measures may be evaluated. Please note that potable groundwater use is not proposed for this facility.

6.0 TEMPORARY CONSTRUCTION FACILITIES

6.1 Site Security

Fencing will be installed during remedial action, at a minimum along the northern and eastern property lines adjacent to Paradies Lane and South Ohioville Road respectively. Fencing along the eastern portion of the parcel will likely be minimal, as wetlands along the eastern property boundary provide a natural barrier. Access from the west is prevented by fencing along Interstate 87. The Contractor shall assess the integrity of this fencing and augment with additional fencing as needed. The potential exists for the public to enter the Site from the south. The wetlands along the southern portion of the property provide a natural barrier, with only a small portion of dry land near the southwest parcel corner. If during completion of the remedial action evidence exists of trespass, additional means of Site control (i.e., additional fencing) will be installed.

The type of fencing will be determined by the general contractor. The fencing selected will be effective in controlling unauthorized entry and direct interested persons to the main entrance and construction trailers for check-in with Site personnel during construction. Other means of Site control will be evaluated, as warranted, if it is determined fencing alone is not sufficient and additional site controls measures are needed.

6.2 Trailers

During the completion of the remedial action, electronic monitoring equipment will be required to field screen soils for contamination and monitor the air for dust. This equipment is portable and runs on batteries. The persons completing this work will need access to a suitable and clean work area such as a construction trailer for field note preparation, charging equipment batteries and downloading data logged on the equipment for record storage and submission to NYSDEC and/or NYSDOH. The construction office trailer(s) should be equipped to support the use of electronic equipment such as a desk and multiple outlets for plugging in equipment chargers.

The trailer will be of sufficient size to include a table and chairs to support construction related progress meetings. The trailer will also be the repository for construction plans, health and safety plans, stormwater management reports and plans, and this RAWP at a

minimum, and will be secured from unauthorized access during non-work hours for the duration of the project.

6.3 Decontamination Equipment

Construction equipment that comes into contact with contaminated Site soils will be considered contaminated. Prior to this equipment being demobilized from the Site or relocated from a contaminated to non-contaminated area (i.e., relocated to backfill an area with clean imported fill), the equipment must be decontaminated in a manner that removes adhered soils.

Dry decontamination procedures, such as the controlled physical removal of soils adhered to the tracks of the excavator and excavator bucket, and the tires of soil loadout trucks, will be employed based on-Site conditions. If dry decontamination is not suitable, washes/rinses of the equipment in a controlled manner (wet decontamination) will be employed thereby capturing soils and wash/rinse water for proper off-Site disposal.

Wet decontamination can be localized to tires and truck beds if the material is visually limited to those parts of the construction equipment. The waste soils and wash/rinse water will be captured using a stationary or movable decontamination pad. The accumulated soils and water will be kept in the decontamination area and protected from release to the environmental or transferred to 55-gallon drums on a daily basis to mitigate the potential for intermixing with precipitation and increasing the volume for disposal or overflowing the decontamination pad.

Fill/soils and residues generated from the decontamination procedures will be disposed of with the impacted fill/soil mixtures at the approved off-site disposal facilities. Water generated during the decontamination effort will either be transferred into 55-gallon drums or if in small volume, be incorporated into the impacted fill/soil mixtures for disposal at the approved off-site disposal facilities. Any wastes (soils or water) created at the Site will either be profiled, or assumed to be impacted, and then disposed of accordingly.

The drum contents will be characterized through generator knowledge, analytical testing from the remedial investigation and/or additional laboratory testing of the actual waste in accordance with the target disposal facility's permit requirements. Waste profile

paperwork will be reviewed by the Remediation Engineer and signed by an authorized representative of the Site Owner.

Trucks entering and exiting the Site will be subject to the requirements of the Site-specific erosion and sediment control measures outlined in this RAWP and site-specific Stormwater Pollution Prevention Plan (SWPPP), which will include the requirements of a stabilized construction entrance to mitigate fill/soil from being tracked off-Site and onto roadways. The Contractor is responsible for confirming that every existing truck loaded with material is sufficiently cleaned of spilled soil to prevent tracking of soil from the site or damaging windshields of motorists. The public roadway(s) where trucks exit the Site will be monitored by the Remediation Engineer's field representative. If fill/soil tracking is apparent, improvements to the erosion and sediment controls and fill/soil loading procedures will be required and implemented, and the Contractor shall be responsible for remediating all material tracked onto roadways from the site, and settling any claims from motorists due to damage windshields. Trucks entering and exiting the Site will also conform to the Site's State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity.

6.4 Construction Entrance

A stabilized construction entrance(s) will be installed in accordance with a Site-specific SWPPP to mitigate the tracking of potentially contaminated fill/soil onto public rights-of-way from vehicle traffic exiting the Site. The location of the construction entrance will be determined in conjunction with the Site Plan Engineer taking into consideration remediation and construction sequence.

6.5 Impacted Soil Handling

Soil contaminated with pesticides and/or heavy metals at concentrations exceeding Commercial Use SCOs is present throughout the majority of the Site as either surface soil (0-1 feet bgs), or subsurface soil (0-4 feet bgs), as depicted on Figure 2 - *Map of Soils Exceeding SCGs*. Soil management (i.e., excavation, off-site disposal, or relocation, and/or remain in place with a Surface Cover System) will be determined by soil contamination type, extent and location; and the proposed placement of above grade structures and/or hardscapes.

Upon preparation of the detailed Site Plan, the Remediation Engineer will prepare Engineering Drawing indicating areas anticipated for excavation and off-site disposal, and excavation and on-site relocation, based on the cut and fill plan prepared by the Site Plan Engineer. The Site Drawing will be reviewed and approved by NYSDEC prior to implementation.

In areas where above grade structures and/or hardscapes will be constructed as part of site development, such as a building structure, concrete, asphalt paving, pavers, etc., will not require an additional Surface Cover System (one foot of soil not exceeding Commercial Use SCOs, see Section 5.1.1.7). These structures and hardscapes will serve as part of the surface cover system. Wherever such structures/hardscapes are not proposed, a Surface Cover System will be placed in accordance with Section 5.1.1.7 to cover the entire area of contaminated soil.

It is anticipated that areas where exposed soils will remain and exceedances above Commercial Use SCOs are documented, will be excavated up to a foot below grade. Following the one-foot excavation, these areas will be backfilled with one foot of soil not exceeding applicable SCOs (see Section 5.1.1.7 for requirements on backfill), which will be considered part of the Surface Cover System.

The handling of contaminated soil will involve direct loading into dump trucks or trailers, and if not directly loaded, temporarily stockpiled on-Site. For soil stockpiling, the soil will be staged on a minimum of 12-mil poly and covered with the same and sufficiently weighted to mitigate washout by rainwater. A hay bale berm or equivalent of sufficient size to accommodate the pile will be installed beneath the bottom layer of poly on three sides to keep surface water from running into stockpiled soil. For directly loaded soil, the truck/tractor trailers will be covered during transport with solid covers (not mesh), and if soil exhibits excessive moisture content where free-standing water will likely be released, the truck gates will be sealed and/or lined with plastic and a soil dewatering agent will be incorporated into loaded wet soil as ordered by the Remediation Engineer. Mesh tarps or covers will not be allowed for trucks hauling impacted fill/soil from the Site.

To facilitate disposal of contaminated soil at an off-site disposal facility (and to enable direct load-out of material into dump trucks and/or trailers), waste characterization samples could be collected prior to initiation of remedial activities. Waste

characterization activities to be conducted by the Remediation Engineer or a qualified environmental subcontractor to the Contractor. Waste characterization will be accomplished by advancing exploratory test pits and/or soil borings for collection of representative fill/soil samples for laboratory analysis. The number of samples and analytical requirements will be in accordance with the target disposal facility(ies) permit requirements.

Disposal facility approval letters and other related documentation shall be submitted to the Remediation Engineer and the NYSDEC Project Manager for review and approval prior to the exportation of contaminated fill/soil.

Reuse of on-site soils for backfilling purposes will be evaluated on a case-by-case basis, in consultation with NYSDEC. Excavated soils generated from the limited excavation at/around MW3-TPN2, MW3-TPE2, and MW6-TPW1 will be disposed off-site and are not suitable for on-site reuse. Excavate soils for regrading purposed could potentially be reused as backfill under the Surface Cover System. On-site soils anticipated to be reused on-site must meet the requirements of Section 9.4, Imported Fill Testing (i.e., form completion, testing, etc.), unless otherwise approved by NYSDEC.

6.6 Groundwater Dewatering During Construction

It is anticipated that dewatering may be warranted during construction in selected areas of deeper excavation as required by the Site Plan.

Dewatering will require special handling, and treatment if on-site discharge is proposed. The method of dewatering and containment/treatment has not been determined. Groundwater encountered during construction must be considered contaminated and will require treatment or proper disposal until chemical testing can document that the applicable groundwater effluent discharge limitations have been met and approval is granted by the Remediation Engineer and the NYSDEC.

Allowable means of handling contaminated groundwater generated from excavation dewatering may include the following:

- Discharge the treated water to the closest connection to the municipality's stormwater collection system. Applicable permitting requirements and discharge

standards would be provided by the municipality (Town of New Paltz) and followed.

- Contain untreated water in temporary holding tanks and bulk transport off-Site to a disposal facility permitted to accept the waste. If deemed necessary by the accepting facility, characterization of the water through chemical testing will be implemented prior to removal from the Site. The results of the testing (if warranted) shall be provided to the accepting facility for approval prior to delivery.

- Request authorization from NYSDEC Project Manager for the on-Site, short-term release of treated water from dewatering activities in batches. Discharges must meet NYSDEC's Groundwater Effluent Criteria and any other discharge requirements imposed by the Town and/or State.

If on-Site, short-term release of treated groundwater in batches is the proposed alternative, the following steps will be implemented:

1. Design of a dewatering treatment system to be reviewed and approved by NYSDEC.

2. Samples will be collected prior to each discharge event of up to 20,000 gallons. Discharge may not commence until the Remediation Engineer has confirmed that sample results show compliance with NYSDEC's Groundwater Effluent Criteria or other criteria deemed appropriate by NYSDEC.

3. Only waters generated at the Site during sampling, pump tests, well development, or dewatering of excavations, are authorized for treatment and discharge.

4. Samples and measurements, to comply with the monitoring requirements specified above, must be taken from the holding tank prior to discharge to groundwater.

5. Discharge may not occur unless the ground is capable of accepting the treated effluent. The discharge water may not be ponded on top of saturated or frozen ground or permitted to flow across the ground surface. A minimum separation distance of 100 feet must be maintained between the discharge location and any

surface waters (including wetlands). Alternatively, a SPDES permit to discharge treated groundwater to the adjacent surface water body could be evaluated, if the treated effluent meets local, state and federal discharge limits, and if approved by the Town of New Paltz and the NYSDEC. The consideration of this option will depend on the water quality and estimated discharge volume.

6. Discharge is not authorized until such time as an engineering submission showing the method of treatment and discharge is approved by the NYSDEC. The discharge rate may not exceed the effective treatment system or ground adsorptive capacity, if applicable. All monitoring data, engineering submissions and modification requests must be submitted to the Remediation Engineer and NYSDEC Project Manager.

7.0 SITE CONTROLS DURING REMEDIAL ACTION

7.1 Stormwater Management

The cumulative area of soil disturbance for this project is anticipated to be greater than one acre requiring the Applicant to obtain coverage under the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity before commencing construction activity.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared for this project as part of the site plan application for the Town of New Paltz. The SWPPP will comply with the latest version of the SPDES General Permit for Construction Activity and include erosion and sediment control measures, pollution prevention measures and if applicable, post-construction water quality treatment and stormwater detention that meets the guidelines outlined in the latest version of the New York State Stormwater Management Design Manual and the New York Standards and Specifications for Erosion and Sediment Control (aka The Blue Book).

The following forms will be completed and submitted to comply with the requirements of the General Permit for Stormwater Discharges from Construction Activity - GP-0-20-001:

- Notice of Intent (NOI) to NYSDEC, which is a request for coverage under the General Construction Stormwater Permit;
- SWPPP Acceptance Form, which is required along with the NOI because the site is located within the boundaries of an MS4. The SWPPP must be reviewed and accepted by the MS4 prior to submitting the NOI to the NYSDEC; and
- Notice of Termination (NOT) to NYSDEC, which is a notification that the construction project is complete and has met the requirements of the construction permit.

The NOI, SWPPP Acceptance Form and NOT will be prepared during the Site plan approval process with the Town of New Paltz. The SWPPP, NOI and SWPPP Acceptance forms will be provided to NYSDEC under separate cover after approval from the Town of New Paltz, but prior to start of construction. The NOT will be provided to NYSDEC upon completion of the Site disturbance portion of the project.

7.2 Air Monitoring

A Community Air Monitoring Plan (CAMP) will be followed during ground intrusive remedial activities (i.e., excavation and handling of site soil). The intent of CAMP is to provide a measure of protection for downwind sensitive receptors including nearby occupants of local residences and businesses, on-Site workers and workers not directly involved with the subject work activities from potential airborne contaminant releases as a direct result of remedial work activities. The CAMP is not intended for use in establishing action levels for worker respiratory protection. The CAMP will monitor the air for dust (particulate air monitoring, see Section 7.2.1) and volatile organic compound vapors (VOC air monitoring, see Section 7.2.2) at the downwind perimeter of the work area. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. A generic CAMP and Special Requirements CAMP are included as Appendix C.

7.2.1 Particulate Air Monitoring

Three (3) real-time particulate monitors capable of continuously measuring concentrations of particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) will be utilized. The instruments will be placed at temporary monitoring stations based on the prevailing wind direction each day, one (1) upwind and two (2) downwind of the designated work areas. The locations will be concentrated to the north, south and east property lines.

The particulate monitoring instruments will be connected to electronic telemetry for remote monitoring of the short-term exposure limit (STEL) or 15-minute averaging period, as well as all other parameters that the instrument reads. The recorded data will be monitoring on a laptop maintained in the construction trailer and the notifications can be set to send to email, text message or both. Instantaneous readings are also recorded, and all data is stored through the website for the duration of the project.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that

downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped, and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

In the event of poor weather such as heavy rain, particulate monitoring will not be performed for protection of the instrumentation. These weather conditions would limit the effectiveness of the sensitive monitoring equipment and likely suppress particulate generation, if present. Work activities will be halted if fugitive dust migration is visually observed for a sustained period.

7.2.2 Volatile Organic Compound Air Monitoring

The contaminants of concern for the UST removal portion of the remediation are petroleum products stored in the UST and potentially petroleum contaminants in soil which include volatile and semi-volatile organic compounds that have the potential to be released to the environment when disturbed. A VOC monitor (MiniRAE 3000s or comparable equipment) will be included in the protective enclosures with the particulate monitors where UST related work is performed. Upwind concentrations will be measured based on wind direction to evaluate the Site's background conditions.

The VOC monitors will monitor the short-term exposure limit (STEL) or 15-minute averaging period, as well as all other parameters that the instrument reads. This instrument can bet set to alarm when readings exceed the NYSDOH Generic Community Air Monitoring Plan action levels for particulates, as listed below. The recorded data will be monitored on a laptop maintained in the construction trailer and the notifications can be set to send to email, text message or both if a sufficient on-Site wireless connection is available. Instantaneous readings will also be recorded, and all data will be logged for the duration of the project.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area, exclusion zone or at the property boundary exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area, exclusion zone or at the property boundary persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. Work activities will then be evaluated to determine the source and engineering controls required to reduce/eliminate organic vapors.

7.3 Noise and Vibration Control

There is potential for noise and vibration to be an issue depending on the means and methods selected by the construction contractor to excavate the Site soils for site development. If sheet piling is used to facilitate excavation of Site soils (not anticipated), this RAWP will require the contractor to plan for and provide, as necessary, controls to mitigate noise and vibration from adversely affecting the community.

7.4 Dust Control

Dust suppression techniques will be implemented as necessary to control fugitive dust to the extent practical during remediation and construction activities. Such techniques will be employed, at a minimum, if the community air monitoring results indicate that particulate levels are above action levels. All reasonable attempts will be made to inhibit visible and/or fugitive dust emissions. Techniques to be utilized by the contractor may include one or more of the following:

- Applying water to haul roads.
- Wetting equipment and excavation faces.
- Spraying water on excavator buckets and loaded material during excavation and dumping.
- Hauling materials in containers or vehicles with tarps installed.
- Restricting vehicle speeds on-Site.
- Covering excavated areas and materials after excavation immediately after activity ceases.

The Contractor shall be required to perform dust control measure in a manner consistent with the applicable portions of the New York State Stormwater Management Design Manual and the New York Standards and Specifications for Erosion and Sediment Control (aka The Blue Book).

7.5 Odor Control

Nuisance odors are not anticipated to be encountered during the implementation of the remedy and during the disturbance of existing Site soils/waste. If nuisance odors are noted during future Site excavation work, the contractor should be prepared to implement actions to mitigate off-Site impacts from odors, as outlined below.

The means and measures of odor control should be capable of controlling emissions of nuisance odors off-Site and on-Site. Specific odor control methods to be used could include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) daily cover of odorous soils/waste; (e) use of chemical odorants in spray or misting systems; (f) implement monitoring for odors in surrounding neighborhoods, and (g) removing the offending materials from the site to an approved disposal facility.

If nuisance odors are identified at the Site boundary, or if odor complaints are received, work shall be halted, and the source of odors will be identified and corrected. Work will not resume in the impacted area until nuisance odors have been abated or otherwise

controlled. The NYSDEC Project Manager will be notified if odor events, and odor complaints are received.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, NYSDEC will be consulted, and an acceptable means of continuing excavation will be developed.

7.6 Environmental Construction Observation and Certification

Observation during subsurface disturbance of existing soils for the purpose of constructing building foundations, installation of stormwater management basins, groundwater dewatering and installation of the surface cover system will be employed. The timeframe of discontinuing observation by the Remediation Engineer will be discussed with the Volunteer and NYSDEC, prior to discontinuation.

Periodic observation and general oversight by a registered Professional Engineer is required for remedial actions. The Remediation Engineer must be a Professional Engineer licensed in the State of New York and must have prior remediation experience. The Remediation Engineer will certify that the remedial work is completed in accordance with the requirements outlined in this RAWP. The Remediation Engineer will supervise the staff performing environmental construction observation. The Remediation Engineer will also perform the engineering review of remedial related Contractor submittals and field changes for the remedial related work to verify compliance with the approved RAWP.

8.0 HEALTH AND SAFETY PLAN (HASP)

Each contractor planning to work on any construction work related to the disturbance of existing Site soils/waste shall be responsible for preparing a Health and Safety Plan (HASP) in compliance with NYSDER-10, and 29 CFR 1910, 29 CFR 1926, and applicable Federal, State and local regulations. Each contractor shall provide a Site-specific HASP that is certified by a Certified Industrial Hygienist or Certified Safety Professional. The contractor's employees will be required to have read and understood their company's Site-specific HASP and completed the required training prior to completing the work.

The Remediation Engineer will conduct work in accordance with the HASP provided in Appendix D prepared specifically for this Project. This HASP is a modified version of the HASP that was prepared for the remedial investigation. It has been modified to address the specific tasks outlined in this RAWP and incorporate relevant changes since the completion of the remedial investigation. It includes those specific remedial tasks that were not already addressed within that plan.

The Site work contractor or any contractor working on-Site during the disturbance of existing soils shall develop and implement an Air Monitoring Program (AMP) for its personnel. The AMP shall be used by the contractor to determine the proper level of personnel protective equipment to use, and to document that the level of protection utilized is adequate. The contractor will be responsible for assuring levels of organic vapors and particulates during intrusive Site work and backfilling do not exceed established action levels indicated in New York State Department of Health's Generic Community Air Monitoring Plan.

A copy of the health and safety plans will be available at the Site during the performance of remedial activities to which they are applicable.

9.0 CONFIRMATION AND DOCUMENTATION SAMPLING

9.1 Tank Closure Sampling and Sampling Underneath Refuse Pile

There is currently one (1) known UST located within the northeast quadrant of the site (refer to Figure 4 – *Remedial Action Implementation Plan and Details*) and a refuse pile in the central portion of the Site. Upon removal of the tank (following emptying and cleaning procedures, See Section 5.1.1.3) and refuse pile, Remediation Engineer's field representative will assess the soils surrounding the tank and refuse pile for organic vapors employing Photoionization Detector (PID) Jar-headspace analysis and organoleptic perception.

If the soil does not appear impacted, and the bottom of the tank or refuse pile is in native soil, post-remediation confirmation samples will be collected per Section 9.2. If the soil does not appear impacted, and the bottom of the tank or refuse pile is in fill material, the fill material will be excavated to native soils and post-remediation confirmation samples will be collected per Section 9.2.

If the soils appear impacted, additional excavation will be conducted until the soils no longer appear impacted employing the above field screening methods. Floor and sidewall samples will be collected from the tank excavation or excavation below the refuse pile (as warranted) for laboratory analyses (see Section 9.2) to document that the impacted soils have been sufficiently remediated. The impacted soils will be staged on poly, covered and sufficiently weighted, pending waste characterization and off-site disposal.

9.2 Post-Remediation Confirmation Sampling

Post-remediation soil samples will be collected following excavation of pesticide/heavy metals performed in accordance with Section 5.1.1.4, removal of refuse pile in the central portion of the Site, and following removal of the UST(s) and all impacted soil if encountered, in accordance with Section 9.1. Furthermore, post-remediation confirmation sampling could be conducted in areas where exceedances above Commercial Use were not documented prior to the remedial action (north and northwest portions of the Site) if cross contamination is anticipated as a result of development activities. This determination will be made in conjunction with NYSDEC.

The sampling is intended to document that the Commercial Use SCOs have been met and/or whether a surface cover system is warranted. The following analytical parameters will be requested:

- Petroleum Impacted Sources and refuse pile area: TCL VOCs and SVOCs by USEPA Methods 8260 and 8270, TAL metals by USEPA Method 6010 (without cyanide), and TCL Polychlorinated bipheynls (PCBs) by USEPA Method 8082 A.

- Pesticide and Heavy Metal Impacted soil exceeding SCGs, excavated within areas shown on Figure 4 – *Remedial Action Implementation Plan and Details, and refuse pile are:* TCL Pesticides via EPA 8081B, and TAL Metals by EPA Method 6010 (without cyanide)

The analytical results will require NYSDEC ASP Category B Data Deliverables and the most recent version of NYS EQuIS electronic data deliverables (EDDs) submissions.

The frequency of post-remediation confirmatory soil sampling will conform, at a minimum, to the requirements of NYSDEC DER-10 guidance. Generally, post-excavation verification soil samples will be collected at a frequency of one (1) grab sample per each approximately 900 square feet of excavation floor and one (1) sample from the bottom of the excavation sidewalls for every 30 linear feet of sidewall, pursuant to DEC DER-10. Sampling frequency may be adjusted depending on the dimensions of the excavation with approval from NYSDEC.

The analytical results will be subjected to data validation. Data validation will be performed in accordance with the USEPA National and Regional Validation Guidelines/Procedures to determine the applicable qualifications of the data. The validator will then prepare a Data Usability Summary Report (DUSR) in accordance with NYSDEC guidance. The DUSR will be prepared for each sample delivery group analyzed by the laboratory. A comprehensive summary of the multiple DUSRs generated throughout the project will be described in the FER.

9.3 Groundwater Treatment Documentation Sampling, if Applicable

Groundwater treatment may be necessary during construction activities. The documentation and sampling necessary for the groundwater treatment system depends on the type of treatment selected. Typically, sampling will include influent and effluent sampling to gauge system effectiveness and conformance to applicable permit discharge limits. If on-Site treatment of water generated during dewatering activities utilizing granular activated carbon is used, carbon change-out frequency will be determined by the manufacturer and performed and documented by the contractor to ensure adequate performance. The proposed sampling frequency and analysis will be presented to NYSDEC for concurrence prior to implementation.

9.4 Imported Fill Testing

9.4.1 General

Imported fill to be used as part of construction activities must be reviewed and approved for use by the Remediation Engineer and the NYSDEC. The source of the fill and the analytical data will be provided to the NYSDEC for review and approval prior to importing the fill to the Site using a *Request to Import/Reuse Fill or Soil Form* included as Appendix E.

The sampling and analysis requirements for fill imported to the Site are set forth in 5.4(e)10 of DER-10, Technical Guidance for Site Investigation and Remediation (DER-10). Table 9.4-1 summarizes the frequency and analyses required based on total volumes.

Table 9.4-1 Recommended Number of Soil Samples for Soil Imported to the Site			
Contaminant	Volatile Organic Compounds	Semi-volatile Organic Compounds, PFAS, Inorganics & PCBs/Pesticides	
Imported Backfill Quantity in Cubic Yards	Discrete Samples	Composite Samples	Discrete Samples/Composites
0 – 50	1	1	3-5 Discrete samples from different locations in the fill being provided will compromise a composite sample for analysis
51 – 100	2	1	
101 – 200	3	1	
201 – 300	4	1	
301 – 400	4	2	
401 – 500	5	2	
501 – 800	6	2	
801 – 1,000	7	2	
> 1,000	Add an additional two volatile organic compound discrete samples and one composite sample for each additional 1,000 cubic yards or consult with NYSDEC		

9.4.2 Chemical Testing Waiver

Any material other than soil may be imported to the Site, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 100 sieve and consists of: gravel, rock or stone, consisting of virgin material from a permitted mine or quarry. Documentation of these conditions still needs to be submitted to NYSDEC using the Request to Import/Reuse Fill or Soil Form in Appendix E and include a gradation analysis.

10.0 APPLICABLE PERMITS AND APPROVALS

10.1 Site Plan Approval

A Site Plan has been prepared for the Site. This RAWP is intended to be implemented concurrently with Site construction activity. The Applicant anticipates gaining Site plan approval in 2024.

10.2 Stormwater General Permit Coverage

A SWPPP will be prepared and presented to the Town of New Paltz during the Site Plan application process. The SWPPP, NOI and SWPPP Acceptance forms will be provided to NYSDEC under separate cover after approval from the Town of New Paltz, but prior to the start of construction. A SWPPP to be prepared by others will be reviewed by the Remediation Engineer for consistency with approved RAWP.

10.3 Impacted Water Related Permits

The permits related to the handling of impacted water generated from dewatering activities are summarized as follows:

- Town of New Paltz Permit to Discharge Treated Water to Storm Sewer System
- Part 364 Permit for Haulers of Untreated Water to a Disposal Facility
- NYSDEC Short Term Discharge Permit (if warranted)
- A USACOE permit. Covered under Nationwide Permit #39 in accordance with Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. A pre-construction notification to ESACOE is required.
- A permit from the Town of New Paltz, in accordance with Town Code Chapter 139 for the proposed wetland and buffer zone disturbances. The Town of New Paltz Planning Board will likewise need to approve placement of the Soil Cover system within wetland buffer zones within the BCP Site. The Contractor shall provide to the Town for review, design details of mitigation measures that will be

employed during placement of the soil cover system up to the leading edges of adjacent wetlands.

The actual permits needed will be determined after the selection of a particular or combination of handling and disposal methods. Required stormwater management permits are detailed in Section 7.1.

11.0 SITE RESTORATION

11.1 General

The Site will be restored upon completion of remediation/redevelopment work in accordance with the Site development plans for Commercial Use of the Site. A Site Plan has been prepared and Construction Drawings are progress. The future Site development plans will include grading plans and stormwater management plans, the details of which will be incorporated into the overall Site remedy.

12.0 QUALITY ASSURANCE PROJECT PLAN

A quality assurance project plan (QAPP) is necessary to present the organizational structure and data quality objectives (DQOs) for the remediation, and the quality assurance (management system) and quality control methods to be implemented to ensure that the quantity and quality of the data required for its intended use is obtained and documented (i.e., that DQOs are met). The following sections outline the means and methods that will be used to obtain representative data of a known quality and sufficient quantity.

12.1 Project Organization

The Volunteer has organized a team of professionals to undertake this project on their behalf. Below is a list of the main members of the team.

- Site Owner: Ulster County
- Design Team: To Be Determined
- General Contractor: To Be Determined
- Remediation Engineer: C.T. Male
- Architect: Urbahn Architects

The Remediation Engineer will be responsible for the overall administration and quality control/quality assurance of the remedial action implementation. These will include project management, engineering design, coordination, and scheduling of activities in-house and with qualified subcontractors, and environmental construction observation. Data validation services will be performed by a subcontractor to the Remediation Engineer, by a qualified third-party not involved with any other aspect of the project. The laboratory analytical testing, as applicable, will be subcontracted to a NYSDOH certified laboratory.

Key individuals from C.T. Male for the remedial action and their associated title are presented below:

- Project Manager: James D. McIver, P.G.

- Project Environmental Engineer: Rosaura Andújar-McNeil, P.E.
- Project Senior Scientist: Eric White
- Office Health & Safety Officer: Nancy Garry, P.E.
- Site Health & Safety Officer: To Be Determined
- Field Geologists: Mary Loughlin, GIT
- Quality Assurance Officer: Jeffrey Marx, P.E.
- Data Validator: To Be Determined (Third Party)

12.2 Final Surface Cover Thickness Verification

The remedial action includes placement of a final surface cover (asphalt, concrete or vegetated soil) across the Site. The method to be employed for determining the required thicknesses are being achieved is as follows:

- A demarcation layer will be placed on top of the rough graded soil, the surface of which will be surveyed by a New York State licensed land surveyor to establish the baseline for measuring and documenting the thickness of cover materials. The frequency of surface elevations will be 30 feet by 30 feet grid, except within the footprint of the building. No demarcation layer will be placed in areas proposed for driveways, paved surfaces, parking, stormwater basins or building foundation.

- During the placement of the final surface cover, the thickness of the cover materials will be periodically measured by the environmental construction technician observing the work to document that the minimum thicknesses are achieved.

- The Contractor will be required to place the cover materials using their own surveying and grading control. Upon satisfactory placement of the final surface cover, the Contractor will be required to retain a New York State licensed land surveyor to survey the surface of the cover materials and certify that the required thickness of cover materials has been achieved. The frequency of surface

elevations will be a 30-feet by 30-feet grid and using similar locations to those prior to collection.

- The Contractor's NYS licensed land surveyor will be required to prepare a topographic map upon completion of work showing the elevation of the demarcation layer and elevation of final grades and prepare a certification that the thickness requirements of the cover materials has been achieved.

12.3 Post-Remediation Verification Sample Analytical Requirements

Post-remediation sampling will be performed in accordance with Section 9.2. The analytical results will require NYSDEC ASP Category B Data Deliverables and will be subjected to data validation. Data validation will be performed by a third-party validator, who will utilize the USEPA National and Regional Validation Guidelines/Procedures to determine the applicable qualifications of the data. The validator will then prepare DUSRs in accordance with NYSDEC guidance. Validated data will be submitted in an electronic data deliverable (EDD) that complies with NYSDEC Electronic Data Warehouse Standards (EDWS).

12.4 Quality Assurance/Quality Control for Sample Collection

12.4.1 Quality Assurance

The Quality Assurance (QA) objective for this project is to produce data which is technically valid and of a known quality that meets the needs of its intended use. The following paragraphs outline the procedures to be followed during sample collection.

Proper chain of custody will be established and maintained through a series of steps, beginning in the field, and ending with final disposition of the analyzed sample. At the time of the field sampling, an external chain of custody form will be utilized to track sample collection until delivery to the analytical laboratory. An internal or "intra-laboratory" chain of custody will be used by laboratory personnel to track the sample(s) from the point it is received/logged and passed through the laboratory process.

The analytical parameters, analysis methods, acceptable holding times and required method detection limits are presented in Table 10.4.4-1. The analytical methods specified reflect the requirements of the NYSDEC ASP.

Table 12.4.1-1 - Analytical Methods and Requirements

Analytical Parameters	EPA Method	Holding Times(1)	Contract Required Quantitative Limits (as noted)(2)
TCL Volatile Organic Compounds (VOCs)	8260	Soil/Sediment: 7 Days to Analysis (cool to 4° C). Water: 5 Days Unpreserved to Analysis, 12 Days Preserved (HCl to pH<2) to Analysis.	10-100 ug/kg (Soil) 1 to 10 ug/l (Water)
TCL Semi-Volatile Organic Compounds	8270	5 Days to Extraction, 40 Days to Analyze	330 to 800 ug/kg (Soil) 10-25 ug/l (Water)
TCL Pesticides	8081**B**	5 Days to Extraction, 40 Days to Analyze	1.7 to 170 ug/kg (Soil) 0.05-1 ug/l (Water)
TAL Metals	6010/7000 Series	180 Days except for Mercury (26 Days)	0.3 to 500 mg/kg (Soil) 3 to 5,000 ug/l (Water)

Note:
1) Holding times are relative to the verifiable time of sample receipt at the laboratory.
2) The listed method detection limits are practical quantitation limits (PQLs). The method detection limit (MDL) is the best possible detection. Laboratories report PQLs which are typically 4 times the MDL for liquids and varies for solids depending on the quantity of contamination present. Efforts will be made to obtain the lowest possible detection limit. When the guidance value or standard value is below the detection limit, achieving the detection limit will be considered acceptable for meeting that guidance or standard value.
3) As defined in NYCRR Part 360-2.11(d)(6), *Water Quality Analyses Tables*.

12.4.2 Quality Control Checks

To monitor and document the integrity of such factors as sample variability, sampling equipment cleanliness, sampling technique, analytical reproducibility and sample handing which can affect data quality, several field quality control checks will be implemented. These will include taking equipment/field blanks after the sampling equipment has been decontaminated to check for cross contamination and equipment cleanliness; taking duplicate samples to monitor analytical precision/reproducibility and sampling technique; and preparing transport blanks to be transported with the sample

containers for volatile analyses to monitor sample handling. For this project the field Quality Control (QC) checks will consist of one (1) equipment/field blank, and one (1) duplicate sample, during each media sampling for every twenty (20) analytical samples. A transport/trip blank will be prepared for each sample set of groundwater samples to be submitted for volatile analyses anticipated only in areas of petroleum contamination.

Laboratory quality control checks will be those specified in USEPA Methods or in the NYSDEC ASP for the analytical method performed and could consist of some of the following:

- Blanks (method, preparation),
- Initial and continuing calibrations,
- Surrogate spikes,
- Matrix spikes/matrix spike duplicates,
- Duplicate samples, and
- Control samples/matrix spike blanks.

The laboratory will be responsible for performing what is necessary for complying with appropriate standards and certifications of the selected USEPA method and ASP requirements.

13.0 REPORTING AND CERTIFICATE OF COMPLETION

13.1 Final Report

Upon completion of remedial work, a FER will be prepared by the Remediation Engineer summarizing the work completed, any changes to the RAWP, the general findings and results of mitigation efforts, compliance with RAWP and a summary of any confirmation sampling efforts.

A Site Management Plan (SMP) will be prepared concurrently with the FER. The SMP will outline the procedures to manage remaining contamination at the Site. Furthermore, an Environmental Easement will be prepared by the legal counsel of the Applicant and recorded with the Ulster County Clerk. The Environmental Easement will require compliance with the SMP and all the engineering and institutional controls placed on the Site. Compliance with the SMP is required until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36.

The FER and SMP will be prepared in accordance with the most recent templates issued by NYSDEC. The FER and SMP will be certified by the Remediation Engineer, who will be a registered Professional Engineer in NYS with appropriate remediation experience as identified in NYSDEC DER-10.

13.2 Certificate of Completion

The Volunteer will be seeking a Certificate of Completion (COC) from NYSDEC upon completion the Site remediation work and approval of the FER. Given that the Soil Cover System is an integral part of the remedy, it is anticipated the COC will be applied for upon completion of final site grading. Receipt of the COC will likely be issued by NYSDEC following the completion of building construction, site grading and other redevelopment activities.

APPENDICES

APPENDIX A
FIGURES

FIGURE 1

SITE LOCATION MAP

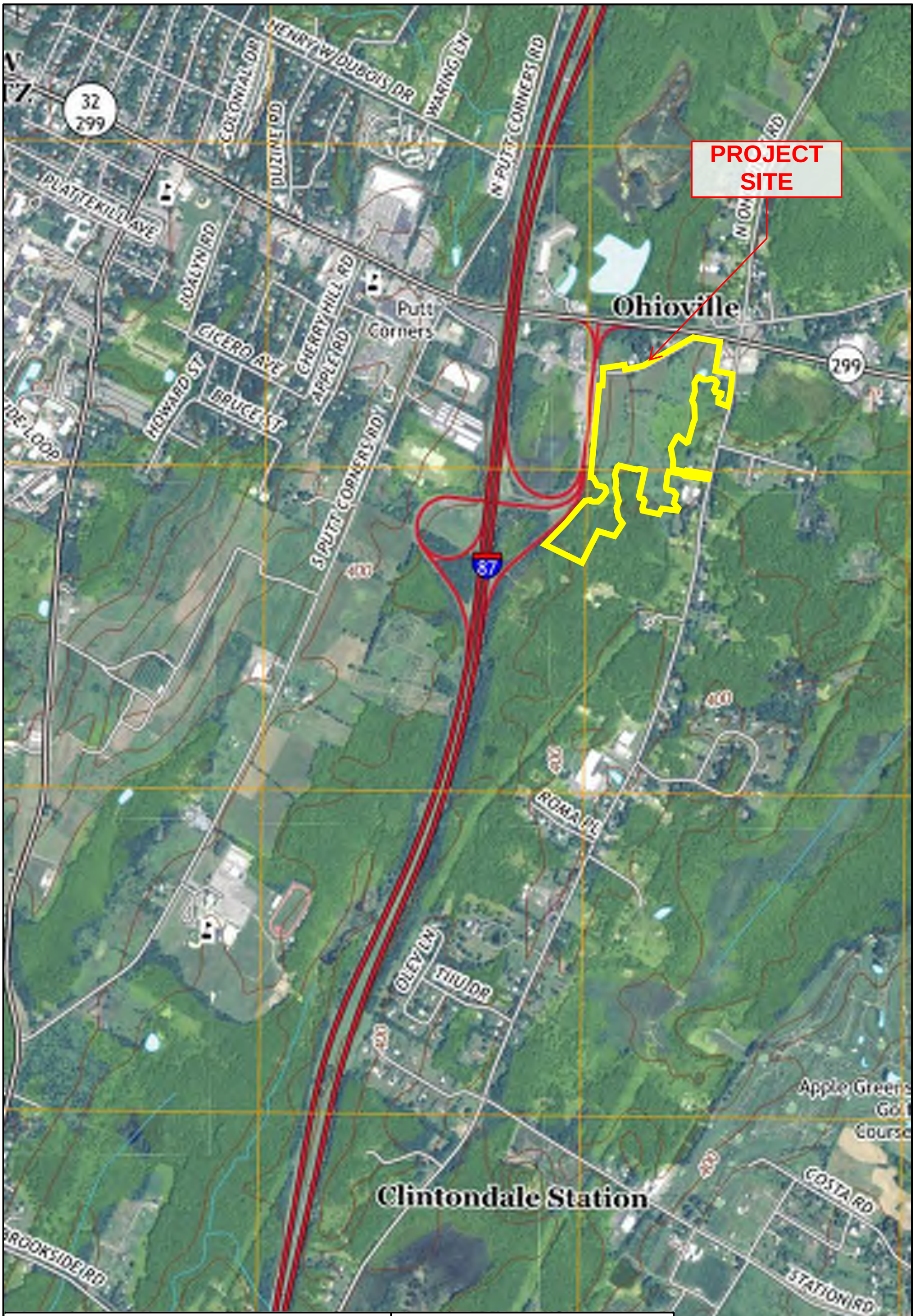


Figure 1: Site Location Map

Town of New Paltz — **Ulster County, New York**

Legend

Approximate Site location Boundary

Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

Project Number: 15.5056
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 14, 2018
File: Fig1_SiteLocationMap2018_11x17.mxd
GIS: C Secor

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

FIGURES 2A, 2B, and 2C
MAPS OF SOILS EXCEEDING SCGs

PROPOSED BCP SITE BOUNDARY

Paradise Ln

SS-37 (0-6in)	
Arsenic	110
Lead	580
Manganese	2,500
Mercury	1.5
Dieldrin	0.69

SS-41 (0-6in)	
Arsenic	20

SS-36 (0-6in)	
Manganese	2,100

SS-38 (0-6in)	
Arsenic	63
Mercury	1.2
Dieldrin	0.39
p,p'-DDE	10

SS-34 (0-6in)	
Arsenic	31
Dieldrin	0.84
p,p'-DDE	12

SS-30 (0-6in)	
Arsenic	47
Chromium	37
Lead	590
Manganese	2,300
Mercury	0.89

SS-35 (0-6in)	
Arsenic	140
Lead	590
Dieldrin	1.2
p,p'-DDE	15
p,p'-DDT	16

SS-04 (0-6in)	
Arsenic	53
Mercury	0.98

SS-32 (0-6in)	
Arsenic	210
Lead	1,200
Mercury	4.6
Dieldrin	3.4
p,p'-DDE	30
p,p'-DDT	28

SS-06 (0-6in)	
Arsenic	340
Lead	2,000
Mercury	9
Dieldrin	2.7
p,p'-DDT	16

SS-31 (0-6in)	
Arsenic	160
Manganese	3,100
Mercury	1.2
Dieldrin	0.12

SS-08 (0-6in)	
Arsenic	27

SS-07 & FD (0-6in)		
Arsenic	23	18

SS-28 (0-6in)	
Arsenic	210
Lead	760
Manganese	3,500
Mercury	2
Dieldrin	0.39

Brouck Farris Blvd

SS-27 (0-6in)	
Arsenic	91
Lead	570
Manganese	3,500
Mercury	2.2
Dieldrin	0.57

SS-09 (0-6in)	
Arsenic	370
Lead	3,000
Mercury	17
Dieldrin	1.8
p,p'-DDT	14

SS-26 (0-6in)	
Arsenic	130
Lead	710
Mercury	1.6
Dieldrin	0.67

SS-10 (0-6in)	
Arsenic	100
Mercury	1.6
Dieldrin	0.25

SS-21 (0-6in)	
Arsenic	58
Lead	420
Mercury	1.5
Dieldrin	0.37

SS-25 (0-6in)	
Arsenic	110
Lead	450
Mercury	2.5
Dieldrin	0.8

SS-22 & FD (0-6in)		
Arsenic	170	210
Mercury	1.5	2.4
Dieldrin	0.23	0.25

SS-19 (0-6in)	
Arsenic	21

SS-20 (0-6in)	
Arsenic	77
Lead	470
Mercury	2.2
Dieldrin	0.37

Exit 18
87

SS-16 (0-6in)	
Manganese	2,300
Mercury	0.88

S Ohioville Rd

SS-34 (0-6in)	
Arsenic	31
Dieldrin	0.84
p,p'-DDE	12

Depth of sample
Parameter exceeds commercial use SCO
Parameter exceeds Protection of Groundwater SCO (for Dieldrin only)
Parameter exceeds restricted residential use SCO

Results in mg/kg (ppm)

DRAFT

0 100 200 400 FT

1 inch = 200 feet

Legend

- Wetland Area
- Wetland Buffer Zone
- Ulster County Tax Parcels (2012)

Disclaimer: The locations and features depicted on this map are approximate and do not represent a field survey.

Figure 2A: Surface Soil Samples Exceeding SCOs (2016)

Town of New Paltz — Ulster County, New York

C.T. MALE ASSOCIATES

PROPOSED BCP SITE BOUNDARY

Paradies Ln

Brouck Ferris Blvd

S Ohioville Rd

TP-04 (2-3ft)
Manganese 2,100

TP-03 (6-7ft)
Manganese 2,200

TP-10 (2-3ft)
Arsenic 57
Dieldrin 0.25

TP-09 (2-3ft)
Arsenic 17

TP-08 (2-3ft)
Arsenic 17

TP-07 (2-3ft)
Arsenic 21

MW-03 (0-2ft)
Arsenic 170
Lead 860
Mercury 0.91
Dieldrin 0.16

MW-04 (0-2ft)
Chromium 41
Manganese 2,100

TP-19 (1.5-2ft)
Arsenic 16

MW-08 (0-2ft)
Arsenic 85
Manganese 2,300
Mercury 1.3
Dieldrin 0.1

TP-16 (1.5-2ft)
Manganese 2,300

MW-07 (0-2ft)
Arsenic 110
Chromium 41
Manganese 2,400
Mercury 1.5
Dieldrin 0.17

MW-09 (0-2ft)
Arsenic 18

MW-06 (0-2ft)
Arsenic 240
Lead 610
Mercury 4.1
Dieldrin 0.71
p,p'-DDT 12

MW-01 MW-02 MW-03 MW-04 MW-05 MW-06 MW-07 MW-08 MW-09 MW-10 MW-11

TP-01 TP-02 TP-03 TP-04 TP-05 TP-06 TP-07 TP-08 TP-09 TP-10 TP-11 TP-12 TP-13 TP-14 TP-15 TP-16 TP-18 TP-19

One or more parameters exceed unrestricted use soil cleanup objectives
MW-11 / TP-15
One or more parameters exceed restricted residential use soil cleanup objectives
MW-04
One or more parameters exceed commercial use soil cleanup objectives
MW-06 / TP-08

TP-75 (1.5-2ft)	
Arsenic	85
Manganese	2,300
Dieldrin	0.17

Depth of sample
Parameter exceeds commercial use SCO
Parameter exceeds restricted residential use SCO
Parameter exceeds Protection of Groundwater SCO (for Dieldrin only)
Results in mg/kg (ppm)

DRAFT

0 100 200 400 FT

1 inch = 200 feet

Legend
Wetland Area
Wetland Buffer Zone
Ulster County Tax Parcels (2012)

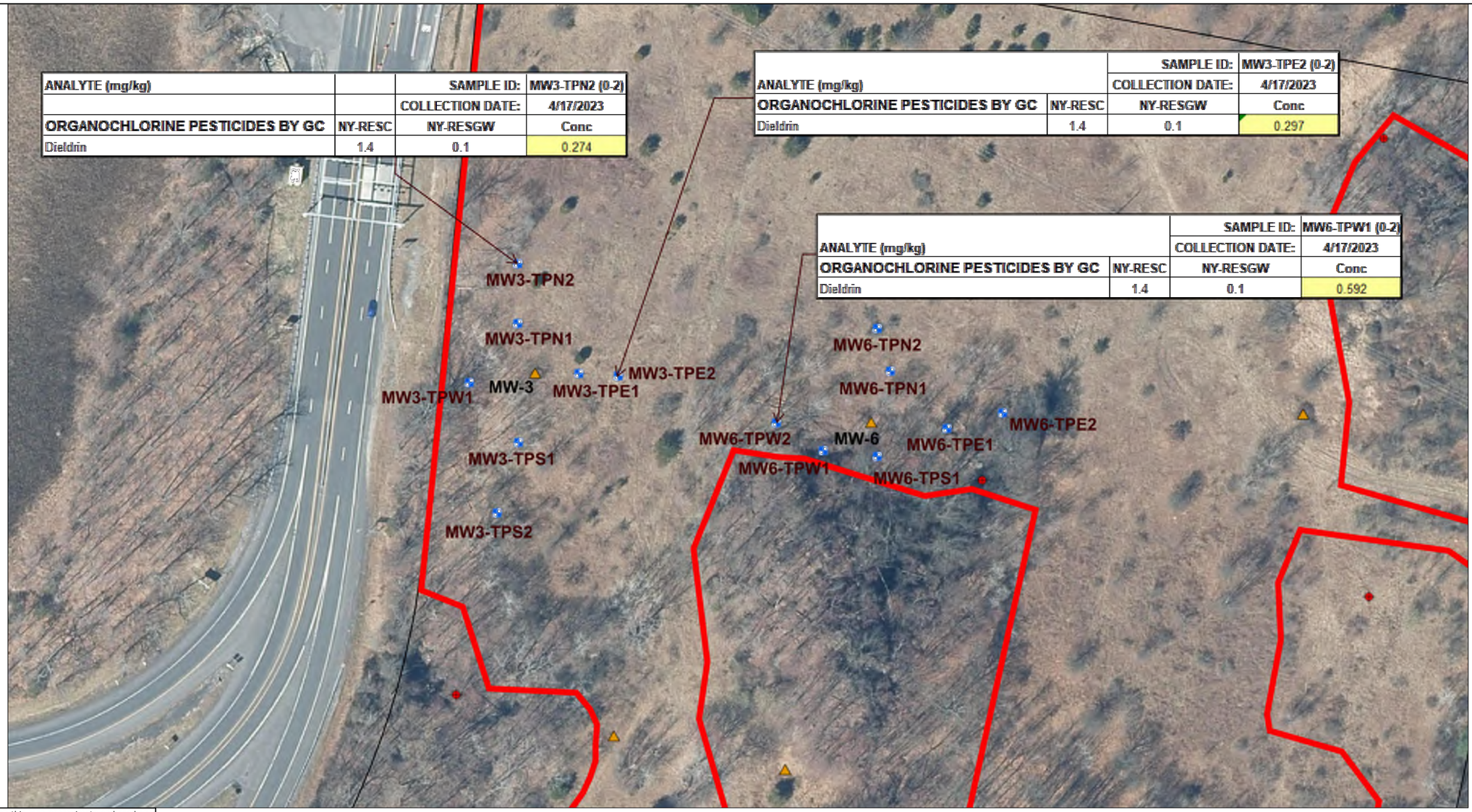
Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

Project Number: 15.5056
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 30, 2018
File: Fig3B2_MWSummaryofLabAnalysis11x17.mxd
GIS: C Secor

Figure 2B: Subsurface Soil Samples Exceeding SCOs (2016)

Town of New Paltz **Ulster County, New York**

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910



ANALYTE (mg/kg)		SAMPLE ID:	MW3-TPN2 (0-2)
		COLLECTION DATE:	4/17/2023
ORGANOCHLORINE PESTICIDES BY GC	NY-RESC	NY-RESGW	Conc
Dieldrin	1.4	0.1	0.274

ANALYTE (mg/kg)		SAMPLE ID:	MW3-TPE2 (0-2)
		COLLECTION DATE:	4/17/2023
ORGANOCHLORINE PESTICIDES BY GC	NY-RESC	NY-RESGW	Conc
Dieldrin	1.4	0.1	0.297

ANALYTE (mg/kg)		SAMPLE ID:	MW6-TPW1 (0-2)
		COLLECTION DATE:	4/17/2023
ORGANOCHLORINE PESTICIDES BY GC	NY-RESC	NY-RESGW	Conc
Dieldrin	1.4	0.1	0.592

Map Note: The Wetland areas depicted on this map approximate on based on the Surface Water Resource Map mad by Engineering and Surveying Properties, PC used in the Draft Environmental Impact Statement.

N

Not To Scale

Legend

- Groundwater Monitoring Well Location
- Surface Soil Sample Location
- Dieldrin Delineation Test Pit Location
- BCP site boundary
- Ulster County Tax Parcels (2012)

Project Number: 15.5056 / 23.3070
Data Source: NYSGIS Clearinghouse
Projection: State Olane NAD83 NYE (Feet)
Date: September 2, 2002
File: Fig2_SamplingLocationMap2018_2022Edits_11x17.mxd
GIS: C Secor/D Landreville
Add Edit: M Loughlin/K Henry

Map Note: The Locations and features depicted on this map are approximate and do not represent a field survey.

Figure 2C: Test Pit Samples Exceeding SCGs (2023)

Town of New Paltz — Ulster County, New York

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1916

Notes:

NY-RESC = New York NYCRR Part 375 Commercial Criteria, New York Restricted Use Criteria

NY-RESGW = New York NYCRR Part 375 Groundwater Criteria, New York Restricted

mglkg = Miligrams per kilogram, equivalent to parts per million

FIGURE 3

MAP OF GROUNDWATER EXCEEDING SCGs

PROPOSED BCP SITE BOUNDARY

Paradies Ln

MW-01	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	2,300
Lead	ND
Manganese	340
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	11.0 J
VOC TICs	ND
Chloroform	ND

MW-02 & FD		
Arsenic	ND	ND
Chromium	ND	ND
Copper	ND	ND
Iron	880	900
Lead	ND	ND
Manganese	210	200
Mercury	ND	ND
Nickel	ND	ND
Zinc	ND	ND
Aroclor (Total)	ND	ND
Dieldrin	ND	ND
p,p'-DDD	ND	ND
p,p'-DDE	ND	ND
p,p'-DDT	ND	ND
SVOC TICs	12.0 J	13.0J
VOC TICs	ND	ND
Chloroform	5.8	3.7

MW-03	
Arsenic	17
Chromium	ND
Copper	77
Iron	37,000
Lead	38
Manganese	2,900
Mercury	ND
Nickel	ND
Zinc	160
Aroclor (Total)	ND
Dieldrin	0.02
p,p'-DDD	ND
p,p'-DDE	0.012
p,p'-DDT	0.025d
SVOC TICs	11.0 J
VOC TICs	ND
Chloroform	2.8

MW-04	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	700
Lead	ND
Manganese	80
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	14.0 J
VOC TICs	ND
Chloroform	ND

MW-05	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	2,400
Lead	ND
Manganese	160
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	13.0 J
VOC TICs	ND
Chloroform	ND

MW-06	
Arsenic	4.5
Chromium	ND
Copper	ND
Iron	7,700
Lead	6.5
Manganese	760
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	0.02
p,p'-DDD	ND
p,p'-DDE	0.093
p,p'-DDT	0.15
SVOC TICs	12.0 J
VOC TICs	ND
Chloroform	ND

MW-07	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	880
Lead	ND
Manganese	230
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	0.017
SVOC TICs	12.0 J
VOC TICs	ND
Chloroform	ND

MW-08	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	320
Lead	ND
Manganese	160
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	12.0 J
VOC TICs	ND
Chloroform	ND

MW-09	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	2,300
Lead	ND
Manganese	200
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	11.0 J
VOC TICs	ND
Chloroform	ND

MW-10	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	750
Lead	ND
Manganese	52
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	12.0 J
VOC TICs	ND
Chloroform	ND

MW-11	
Arsenic	ND
Chromium	ND
Copper	ND
Iron	470
Lead	ND
Manganese	54
Mercury	ND
Nickel	ND
Zinc	ND
Aroclor (Total)	ND
Dieldrin	ND
p,p'-DDD	ND
p,p'-DDE	ND
p,p'-DDT	ND
SVOC TICs	19.0 J
VOC TICs	ND
Chloroform	ND

MW-01 MW-02 MW-03 MW-04 MW-05 MW-06 MW-07 MW-08 MW-09 MW-10 MW-11

87 Exit 18

Brouck Ferris Blvd

S Ohioville Rd

Lead	6.5
Manganese	760

Parameter meets groundwater standard
Parameter exceeds groundwater standard
Results in ug/L (ppb)

DRAFT

0 100 200 400 FT

1 inch = 200 feet

Legend

Wetland Area
Wetland Buffer Zone
Monitoring Well (Garmin 60Cx GPS)
Ulster County Tax Parcels (2012)

Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

Project Number: 15.5056
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 29, 2018
File: Fig4_MonitoringWells_201811x17.mxd
GIS: C Secor

Figure 3: Map of Groundwater Exceeding SCGs

Town of New Paltz **Ulster County, New York**

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

FIGURE 4

REMEDIAL ACTION IMPLEMENTATION PLAN AND DETAILS

PROPOSED BCP SITE BOUNDARY

UST Spill # 14-01829

Approximate location of soils near UST to be remediated

Limited excavation 0-4' below ground surface

Main St
Paradies Ln
Brouck Ferris Blvd
S Ohioville Rd
Exit 18
87

SS-01 SS-02 SS-03 SS-04 SS-05 SS-06 SS-07 SS-08 SS-09 SS-10 SS-11 SS-12 SS-13 SS-14 SS-15 SS-16 SS-17 SS-18 SS-19 SS-20 SS-21 SS-22 SS-23 SS-24 SS-25 SS-26 SS-27 SS-28 SS-29 SS-30 SS-31 SS-32 SS-33 SS-34 SS-35 SS-36 SS-37 SS-38 SS-39 SS-40 SS-41 SS-42

MW-01 MW-02 MW-03 MW-04 MW-05 MW-06 MW-07 MW-08 MW-09 MW-10 MW-11

TP-01 TP-02 TP-03 TP-04 TP-05 TP-06 TP-07 TP-08 TP-09 TP-10 TP-11 TP-12 TP-13 TP-14 TP-15 TP-16 TP-17 TP-18 TP-19

0 100 200 400 FT

1 inch = 200 feet

Legend

- Surface Soil Sampling Locations
- Monitoring Well Locations
- Test Pit Locations
- UST (Spill # 14-01829)
- Wetland Area
- Wetland Buffer Zone
- Ulster County Tax Parcels (2012)

Project Number: 15.5056 / 23.3070
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 14, 2018
File: Fig2_SamplingLocationMap2018_11x17.mxd
GIS: C Secor

Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

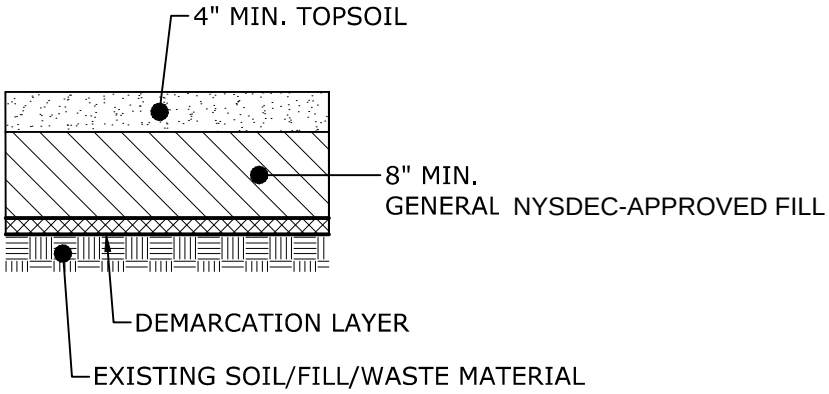
FIGURE 4: REMEDIAL IMPLEMENTATION PLAN AND DETAILS

Town of New Paltz **Ulster County, New York**

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

FIGURE 5

SURFACE COVER DETAILS



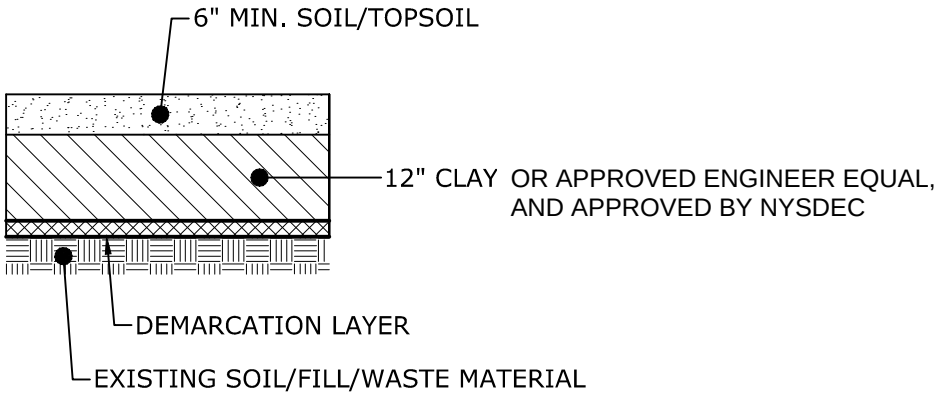
NOTE:

1. THE ENTIRE SCS SHALL BE IN ACCORDANCE WITH THE REMEDIAL ACTION WORK PLAN AND BROWNFIELD CLEANUP PROGRAM.

1
C-501

SURFACE COVER SYSTEM - GENERAL

SCALE: NONE
CROSS REFERENCE: NONE



NOTE:

1. THE ENTIRE SCS SHALL BE IN ACCORDANCE WITH THE REMEDIAL ACTION WORK PLAN AND BROWNFIELD CLEANUP PROGRAM.

2
C-501

SURFACE COVER SYSTEM STORMWATER BASIN

SCALE: NONE
CROSS REFERENCE: NONE

C-501

Date	RECORD OF WORK	Appr.

Drafter: S.WUNSCH | Checker: R. ANDUJAR
Appr. by: R. ANDUJAR | Proj. No. 23.3070

SURFACE COVER DETAILS

TOWN OF NEW PALTZ | ULSTER COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH 518.786.7400
COBLESKILL, NY • GLENS FALLS, NY • POUGHKEEPSIE, NY
JOHNSTOWN, NY • RED HOOK, NY • SYRACUSE, NY
www.ctmale.com

SCALE: NONE | DATE: August 27, 2024

FIGURE 6

EXTENT OF CONTAMINATION IN SOILS MAP AND DRUM CARCASS AREA

PROPOSED BCP SITE BOUNDARY

UST Spill # 14-01829

Approximate area of drum carcasses

Main St
Paradies Ln
Brouck Ferris Blvd
S Ohioville Rd
Exit 18
87

SS-01 SS-02 SS-03 SS-04 SS-05 SS-06 SS-07 SS-08 SS-09 SS-10 SS-11 SS-12 SS-13 SS-14 SS-15 SS-16 SS-17 SS-18 SS-19 SS-20 SS-21 SS-22 SS-23 SS-24 SS-25 SS-26 SS-27 SS-28 SS-29 SS-30 SS-31 SS-32 SS-33 SS-34 SS-35 SS-36 SS-37 SS-38 SS-39 SS-40 SS-41 SS-42 SS-43 SS-44 SS-45 SS-46 SS-47 SS-48 SS-49

TP-01 TP-02 TP-03 TP-04 TP-05 TP-06 TP-07 TP-08 TP-09 TP-10 TP-11 TP-12 TP-13 TP-14 TP-15 TP-16 TP-17 TP-18 TP-19

MW-01 MW-02 MW-03 MW-04 MW-05 MW-08 MW-10

MW3-TPN2 MW3-TPN1 MW3-TPW1 MW3-TPS1 MW3-TPS2 MW3-TPE1 MW3-TPE2

MW6-TPN2 MW6-TPN1 MW6-TPW2 MW6-TPW1 MW6-TPS1 MW6-TPE2 MW6-TPE1

Legend

2016 Data

- Monitoring Well Locations
- Test Pit Locations
- Surface Soil Sampling Locations
- Inferred limit of contamination (Dotted Line)
- Approximate extent of contamination, depth 0 – 4 feet
- Approximate extent of contamination, depth 0 – 1'
- Ulster County Tax Parcels (2012)
- Wetland Area
- Wetland Buffer Zone

2023 Data

- Test Pit Location
- Surface Soil Sampling Location
- Approximate area of unknown drum carcasses
- Approximate area of UST Spill No. 14-01829

DRAFT

0 100 200 400 FT

1 inch = 200 feet

Figure 6: Extent of Contamination in Soils Map and Drum Carcass Area

Town of New Paltz — Ulster County, New York

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

Project Number: 15.5056
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 14, 2018
File: Fig5_ExtentofContaminationinSoilsMap2018_11x17.mxd
GIS: C Secor

Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

APPENDIX B

TABLES

TABLE 375-6.8(B): RESTRICTED USE SOIL CLEANUP OBJECTIVES

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]
Barium	7440-39-3	350[f]	400	400	10,000 [d]	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5[f]	4.3	9.3	60	4	7.5
Chromium, hexavalent [h]	18540-29-9	22	110	400	800	1[e]	19
Chromium, trivalent [h]	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 [d]	50	1,720
Total Cyanide [h]		27	27	27	10,000 [d]	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63[f]	450
Manganese	7439-96-5	2,000[f]	2,000[f]	10,000 [d]	10,000 [d]	1600[f]	2,000[f]
Total Mercury		0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73
Nickel	7440-02-0	140	310	310	10,000 [d]	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9[f]	4[f]
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 [d]	10,000 [d]	10,000 [d]	109[f]	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100[a]	500[b]	1,000[c]	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 [e]	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 [e]	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033 [e]	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04[g]	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100[a]	100[a]	500[b]	1,000[c]	0.04[g]	0.25
Dibenzofuran	132-64-9	14	59	350	1,000[c]	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan II	33213-65-9	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan sulfate	1031-07-8	4.8[i]	24[i]	200[i]	920[i]	NS	1,000[c]
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100[a]	100[a]	500[b]	1,000[c]	20	98
Acenapthylene	208-96-8	100[a]	100[a]	500[b]	1,000[c]	NS	107
Anthracene	120-12-7	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benz(a)anthracene	56-55-3	1[f]	1[f]	5.6	11	NS	1[f]
Benzo(a)pyrene	50-32-8	1[f]	1[f]	1[f]	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1[f]	1[f]	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1[f]	3.9	56	110	NS	1[f]
Dibenz(a,h)anthracene	53-70-3	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]
Fluoranthene	206-44-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Fluorene	86-73-7	100[a]	100[a]	500[b]	1,000[c]	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5[f]	0.5[f]	5.6	11	NS	8.2
m-Cresol	108-39-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
Naphthalene	91-20-3	100[a]	100[a]	500[b]	1,000[c]	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
p-Cresol	106-44-5	34	100[a]	500[b]	1,000[c]	NS	0.33[e]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8[e]	0.8[e]
Phenanthrene	85-01-8	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Phenol	108-95-2	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]
Pyrene	129-00-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Volatiles							
1,1,1-Trichloroethane	71-55-6	100[a]	100[a]	500[b]	1,000[c]	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33
1,2-Dichlorobenzene	95-50-1	100[a]	100[a]	500[b]	1,000[c]	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02[f]
cis-1,2-Dichloroethene	156-59-2	59	100[a]	500[b]	1,000[c]	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100[a]	100[a]	500[b]	1,000[c]	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1[e]	0.1[e]
Acetone	67-64-1	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100[a]	100[a]	500[b]	1,000[c]	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100[a]	100[a]	500[b]	1,000[c]	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33[e]	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100[a]	100[a]	500[b]	1,000[c]	100[a]	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100[a]	500[b]	1,000[c]	NS	0.93
Methylene chloride	75-09-2	51	100[a]	500[b]	1,000[c]	12	0.05
n-Propylbenzene	103-65-1	100[a]	100[a]	500[b]	1,000[c]	NS	3.9
sec-Butylbenzene	135-98-8	100[a]	100[a]	500[b]	1,000[c]	NS	11
tert-Butylbenzene	98-06-6	100[a]	100[a]	500[b]	1,000[c]	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100[a]	100[a]	500[b]	1,000[c]	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).
NS=Not specified. See Technical Support Document (TSD).

Footnotes

[a] The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

[b] The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

[c] The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

[d] The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

[e] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

[f] For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

[g] This SCO is derived from data on mixed isomers of BHC.

[h] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[i] This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

[j] This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

375-6.9 Development or modification of soil cleanup objectives.

(a) Applicability. This section identifies when and the procedures under which a contaminant-specific soil cleanup objective may be developed or modified.

(1) Soil cleanup objectives for contaminants not included in Tables 375-6.8(a) and (b) may be developed by the remedial party or required by the Department.

(2) Soil cleanup objectives for contaminants included in Tables 375-6.8(a) and (b), may be modified based on site-specific data if desired by the remedial party; as set forth in:

(i) subpart 375-3 for Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(iii) and subparagraph 375-4.8(c)(1)(iii).

(3) Protection of ecological resources soil cleanup objectives were not developed for certain contaminants, which are identified in Table 375-6.8(b) as "NS". Where such contaminants:

(i) appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources soil cleanup objective for the contaminant for use in Track 1 and apply such soil cleanup objective where it is lower than the soil cleanup objective set forth in Table 375-6.8(a); or

(ii) are identified as impacting or threatening an ecological resource for a restricted use remedial program the Department may require a protection of ecological resources soil cleanup objective be developed.

(b) New soil cleanup objectives must:

(1) Be developed utilizing the same methodologies that were used by the Department to develop the respective soil cleanup objective, as provided in the Technical Support Document.

(2) Apply the following caps, as set forth in section 9.3 of the Technical Support Document, on any soil cleanup objective included in Tables 375-6.8(a) and (b), with the exception of metals, as set forth in paragraph (3) below, developed for:

(i) unrestricted use, residential use, restricted-residential use and the protection of ecological resources, a maximum value of 100 ppm;

(ii) commercial use, a maximum value of 500 ppm; and

(iii) industrial use and the protection of groundwater a maximum value of 1000 ppm, and

(3) Apply a cap for metals at a maximum value of 10,000 ppm.

(c) Development of unrestricted use soil cleanup objectives. The unrestricted use soil cleanup objective for a compound will be the lowest of the soil cleanup values, calculated as set forth in appendix E of the Technical Support Document, for the protection of groundwater, protection of ecological resources and protection of public health.

(d) Development of restricted use soil cleanup objectives. The protection of:

(1) Groundwater soil cleanup objective will be the values calculated for the protection of groundwater as set forth in appendix E of the Technical Support Document;

(2) Ecological resources soil cleanup objectives will be the values calculated for the protection of ecological resources as set forth in appendix E of the Technical Support Document; and

(3) Public health cleanup objective will be the values calculated for the protection of public health for the identified use of the site, as set forth in appendix E of the Technical Support Document.

(e) Modification of soil cleanup objectives. The contaminant-specific soil cleanup objectives set forth at Tables 675-6.8(a) and (b)[1] may be modified by site specific data as set forth in this subdivision.

[1] Original should read "Tables 375-6.8(a) and (b)"

(1) Contaminant-specific soil cleanup objectives modified in accordance with this subdivision may be utilized by the remedial party for a site remedial program undertaken pursuant to:

(i) subpart 375-3 in Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(ii) and subparagraph 375-4.8(c)(1)(ii).

(2) For the calculation of a protection of groundwater or ecological resources contaminant -specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in appendix E of the Technical Support Document.

(3) For the calculation of a protection of public health contaminant-specific soil cleanup objective, site-specific data may be used to modify two of the five exposure pathways, as follows:

(i) for the particulate inhalation pathway six parameters rely on site-specific data; and

(ii) for the volatile inhalation pathway, four parameters rely on site-specific data.

(4) The algorithms to be used for each protection of public health pathway and details on the parameters which can be substituted are included in appendix E of the Technical Support Document.

(f) Use of soil cleanup objectives developed or modified. Once approved by the Department, contaminant-specific soil cleanup objectives developed or modified as set forth in this section may be utilized by the Department at other sites consistent with paragraphs (1) and (2) below.

(1) Contaminant-specific soil cleanup objectives developed for contaminants not included in Tables 375-6.8(a) and (b), as set forth in subdivision 375-6.9(b) above, will be used as guidance and shall be considered by the Department for inclusion in the Tables in this subpart during any subsequent reevaluation of the soil cleanup objectives, as set forth by ECL 27-1415.

(2) Contaminant-specific soil cleanup objectives modified for site specific parameters, as set forth in subdivision 375-6.9(e) above, may be utilized at sites manifesting similar parameters, if approved by the Department.

GUIDANCE VALUES FOR ANTICIPATED SITE USE – PFOA AND PFOS (APRIL 2023)

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	0.8	1.0

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

[2] The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

APPENDIX C

CAMP AND SPECIAL REQUIREMENTS CAMP

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. APeriodic@ monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

APPENDIX D

HEALTH AND SAFETY PLAN

January 29, 2024

Site Specific Health & Safety Plan

Former Plesser Property Site
55 Paradies Lane
Town of New Paltz
Ulster County, New York
BCP Site No. C356053

Prepared by:

C.T. MALE ASSOCIATES
12 Raymond Avenue
Poughkeepsie, New York 12603
(845) 454-4400

C.T. Male Associates Project No: 23.3070

SITE SPECIFIC HEALTH & SAFETY PLAN
FORMER PLESSER PROPERTY SITE
TOWN OF NEW PALTZ, ULSTER COUNTY

TABLE OF CONTENTS

Page

SITE SPECIFIC HEALTH & SAFETY PLAN
FORMER PLESSER PROPERTY SITE
TOWN OF NEW PALTZ, ULSTER COUNTY

TABLE OF CONTENTS (cont.)

1.0 GENERAL

1.1 Overview

This Site-Specific Health and Safety Plan (HASP) was prepared for use during implementation of Remedial Action (RA) at the Former Plesser Property Site, BCP Site No. C356053 (the Site). The Site is located at 55 Paradies Lane in the Town of New Paltz, Ulster County, New York.

This HASP is written to follow the regulatory requirements and guidelines in the following:

- 29 CFR 1910, OSHA, Safety and Health Regulations for General Industry.
- C.T. Male Associates Health and Safety Manual.
- Federal, State, County, and local guidance on Airborne Infectious Disease and COVID-19.

A designated Office Health and Safety Officer (OHSO) will be responsible for implementing C.T. Male health and safety policies and to ensure field work follows C.T. Male policies. A designated Site Health and Safety Officer (SHSO) will be responsible for implementing this HASP during the completion of the RA field work. All persons or parties who enter the work area (support zone, decontamination zone or exclusion zone) must review, sign, and comply with this HASP. A partial list of individuals authorized to enter the exclusion zone at the Site is presented in Section 13.0 of this HASP. Others may be added to the list as needed. A copy of this HASP will be maintained at the Site throughout the duration of the project. A complete description of the remedial actions are outlined in the Remedial Action Work Plan, dated January 2024. A brief description of the proposed scope of work is outlined below:

<u>Remedial Actions:</u>

- Sample (as warranted), manage, segregate, and dispose of off-Site surface materials (i.e., stumps, brush, incidental C&D materials and debris);
- Decommission groundwater monitoring wells conflicting with proposed construction (as necessary) in accordance with DEC procedures outlined in DEC CP-43 *Commissioner's Policy on Groundwater Well Decommissioning*;

- Remove and dispose of an ~550-gallon underground fuel oil storage tank (associated Spill Number 14-01829), including contents and appurtenances, and any adjacent soil impacted with petroleum contaminants above Commercial Use SCOs;

- Perform limited excavation and off-site disposal of soil at three (3) locations MW3-TPN2, MW3-TPE2, and MW6-TPW1 where soil dieldrin concentrations exceed the PGW SCO, and where dieldrin was detected in associated groundwater;

- Perform limited excavation and stockpiling or direct load-out of soils (if warranted) as required by construction, that are located within known areas of heavy metals/dieldrin contamination. Excavated soils in these areas, if suitable for construction purposes, could be relocated on-site under the Surface Cover System (see below);

- Perform limited excavation(s) as required for construction and dispose and/or relocate soils that are located outside of known contaminated areas, but are not suitable for construction purposes;
- Characterize through sampling and analysis stockpiled soil (if warranted) as required for off-site waste disposal purposes;
- Contain and treat or sample and dispose of off-Site impacted groundwater encountered during construction that may be generated from dewatering activities associated with remediation and/or construction;

- Install a barrier demarcation layer to define the boundary between clean backfill and contaminated soils where applicable;

- Place Engineering Controls in the form of a surface cover system, inclusive of building foundation and slab, pavement and clean fill soils meeting applicable SCOs where required;
- Conduct environmental monitoring, including sampling of groundwater and inspection of Engineering Controls, as required to monitor the effectiveness of the remedy and use restrictions/limitations to prevent exposure to remaining contaminants; and

- Establish Institutional Controls in the form of an environmental easement restricting future land use and groundwater use and requiring periodic inspection of the Engineering Controls for the Site.

A Community Air Monitoring Plan will be established and followed for ground intrusive activities. Excavations will be backfilled with pre-approved imported fill meeting SCOs for Unrestricted Use sites, as applicable.

1.2 Contact Names & Numbers

For this project, the following project contacts have been assigned.

SITE CONTACT:

Ulster County Planning Department:

Dennis Doyle 845-340-3340 (O)

CONSULTANT CONTACTS:

CONSULTING ENGINEER:

C.T. Male Associates 518.786.7400 (O – Latham)
50 Century Hill Drive
Latham, New York 12110

12 Raymond Avenue 845.454.4400 (O – Poughkeepsie)
Poughkeepsie, New York 12603

Daniel P. Reilly, P.E., Project Principal	518.786.7625 (O)
	518.928.9792 (C)
Jim McIver, P.G., Project Manager	845.454.4400 (O)
	845.594.1788 (C)
Rosaura Andújar-McNeil, P.E.	845.454.4400 (O)
Project Environmental Engineer	347.232.1919 (C)
Eric White, Project Scientist	845.454.4400 (O)
	917.863.6835 (C)
Nancy Garry, P.E., CSP	518.786.7541 (O)
Office Health & Safety Officer	518.320.5783 (C)

Jonathon Dippert, P.G. Field Services Manager	518.786.7563 (O) 518.469.1183 (C)
To be determined, based on field staff on-site Site Health & Safety Officer (SHSO)	

EMERGENCY PHONE NUMBERS:

PERSONAL INJURY	Emergency	911
OR EMERGENCY:	Nuvance Health Vassar Brothers Medical Center 45 Reade Place Poughkeepsie, NY 12601 (Approximately 17 minutes)	845.454.8500
FIRE DEPARTMENT:	Emergency New Paltz Fire Department 25 Plattekill Avenue New Paltz, New York 12561	911 845.255.1520
CITY POLICE:	Emergency New Paltz Police Department 83 S Putt Corners Road, Suite #1 New Paltz, New York 12561	911 845-255-1323
NYS POLICE:	Emergency NYS Troop K Headquarters 2541 Route 44 Salt Point, New York 12578	911 845.677.7300
NEW YORK CITY REGIONAL POISON CONTROL CENTER:	New York City Department of Health & Mental Hygiene 455 First Street, Room 123 New York, New York 10016	800.222.1222
NATIONAL RESPONSE CENTER:	c/o United States Coast Guard (G-OPF) 2100 2nd Street, Southwest - Room 2611 Washington, DC 20593-0001	800.424.8802
NYSDEC SPILL HOTLINE:	24-hours	800.457.7362

2.0 HEATLH AND SAFETY PERSONNEL

The Office Health and Safety Officer (OHSO) will be responsible for implementing C.T. Male health and safety policies and to ensure field work follows C.T. Male policies.

The Site Health and Safety Officer (SHSO) or designee will be responsible for implementation of the HASP and the delegation of health and safety duties. The SHSO will coordinate the resolution of safety issues that arise during site work or ask the OSHO, and/or Field Services Manager, Project Manager for direction and compliance of the situation. When the SHSO is not present on-Site, a designee will be authorized to perform the duties of the SHSO, and the designee will be responsible for implementation of the HASP.

The SHSO or designee has authority to stop work upon their determination of an imminent safety hazard, emergency situation or other potentially dangerous situations (e.g., weather conditions). Authorization to resume work will be issued by the OHSO, Project Manager or the SHSO (see Section 11).

3.0 SITE LOCATION AND DESCRIPTION

The Site is located on an irregular-shaped parcel of undeveloped land comprised of two (2) tax parcels: Section 86.12, Block 5, Lots 13.310 and 13.320. The combined parcels are approximately 57.3 acres in size. The parcels that comprise the Site lack a physical address. The location of the Site is shown on Figure 1 – *Site Location Map* in Appendix A. Please note that the boundaries of the BCP site do not fully align with the parcel boundaries. The Site is entered onto from Paradies Lane and/or from South Ohioville Road. Access to the Site is not restricted.

The Site is currently vacant but has historically been used as an orchard. Areas of the Site contain grassy fields and woodlands but have historically been developed for orchard agricultural purposes. Remnants of foundations, concrete paved areas, an asphalt driveway, power lines and several trails exist in the northwestern section the Site. The northern section of the Site contains approximately 1,000 feet of frontage along the southern side of Paradies Lane and NYS Route 299, and 450 feet of frontage along the western side of South Ohioville Road. A small portion of the northernmost tax lot is landscaped. The southernmost portion of the Site is wooded with delineated wetlands. Several trails are present on western and central sections of the Site.

Mega Funworks, Inc., initial Applicant, entered the NYSDEC's BCP as a Volunteer in May 2015 for an approximate 35.98-acre portion of the property (the Site, BCP ID No. 356053) as document in the Brownfield Cleanup Agreement (BCA, Index No.: C356053-03-15). The BCA has been amended to add Ulster County as an additional Volunteer.

The northern portion of the Site is zoned as Gateway Business (GB), and a southern portion is zoned as Light Industrial (I-1). The anticipated reuse of the Site is for an Emergency Call Center for Ulster County. Refer to Figure 2 – *Conceptual Site Plan* in Appendix A.

4.0 POTENTIAL SITE CONTAMINANTS

Petroleum-related site contaminants may be encountered in association with an abandoned UST located near the northwestern property boundary. This UST was located via a ground penetrating radar study performed by DT Consulting Services (DTCS) in the vicinity of concrete building slabs/foundation remnants in 2014. Soil sampling performed by DTCS in the vicinity of this UST identified low concentrations of several volatile organic compounds (VOCs) at depths of 8-12' below ground surface. Site contaminants associated with the existing UST contents and/or surround soil may include petroleum products and associated breakdown products from gasoline and/or diesel.

The nature and extent of the orchard spraying-related Site contaminants associated with the former Site use were identified by the 2016 RI. Subsequent to the 2016 RI, NYSDEC requested the sampling for emergent contaminants in on-site groundwater, which was completed in 2019. A Supplemental Remedial Investigation was also conducted in April of 2023 to further delineate pesticide contamination in on-site soils, at the direction of the NYSDEC. The results of the 2016, 2019 and 2023 investigation are presented in a Revised RI Report, dated January, 2024.

The RI involved the collection and analysis of surface soil samples and excavation of test pits to facilitate sampling of subsurface soil. Collection and laboratory analysis of soil samples was performed to evaluate Site contaminant dispersion; the installation of groundwater monitoring wells, the collection and analysis of groundwater samples, Contaminant Fate Transport Modeling, a Qualitative Human Health Exposure Assessment, and a Fish and Wildlife Assessment.

The primary contaminants of concern (COC) at the Site are:

- Heavy metals arsenic, chromium, lead, manganese, and mercury, and the pesticides dieldrin, dichlorodiphenyldichloroethylene (DDE, surface soils only) and dichlorodiphenyltrichloroethane (DDT) in both surface and subsurface soils (unless otherwise noted).
- Heavy metals iron, lead, and manganese, and the pesticide dieldrin in groundwater.

4.1 Potential Exposure Pathways

Occupational exposure to potentially hazardous substances/chemicals associated with Site work activities could potentially occur by direct dermal contact (skin contact), inhalation, and/or indirect incidental ingestion.

4.1.1 Dermal Contact

The primary route of potential exposure for C.T. Male employees is dermal contact. Personnel conducting sampling, or observation of soil excavation/loading activities, decommissioning wells and handling associated equipment may be exposed to potentially hazardous substances/chemicals by skin contact or adsorption. However, exposure is expected to be limited since workers are required to wear appropriate personal protective equipment (PPE) (i.e., appropriate work gloves, shoes, clothing, and safety glasses, etc.).

4.1.2 Inhalation

Constituents that potentially pose an occupational exposure to employees by the inhalation route may be during UST removal and soil disturbance (excavation and/or loading activities). If a potential inhalation hazard is noted on-Site, C.T. Male staff will immediately stop work and take the appropriate steps to notify SHSO, PM or OHSO. Section 5.5 outlines air monitoring on Site, the Remedial Action Work Plan (RWP) address soil excavation activities. The work being conducted will be reevaluated to determine the potential exposure and further PPE that may be required.

4.1.3 Ingestion

Personnel handling of associated equipment, and during project scope of work activities, could be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE is not used, or personal hygiene is not practiced. Personal protection against ingestion exposure is accomplished by performance of proper decontamination procedures when exiting contaminated work areas and through use of adequate PPE.

5.0 HAZARD ASSESSMENT

5.1 General

For this project a General Contractor, under direct contract with the owner representative, will implement the major activities of the remedial action (soil excavation, off-site disposal and backfilling). The General Contractor and each subcontractor will be responsible for developing and implementing a Site-specific health and safety plan for their activities, for protection of their employees, and use of personal protective equipment. Health and safety plans from C.T. Male's subcontractors shall be submitted to C.T. Male prior to the work beginning for the subcontractor. In addition, if there are training or professional certificates required for the project as per OSHA or other applicable regulations, the subcontractor(s) shall provide copies of certificates to C.T. Male before work begins. The subcontractor will also be responsible for developing and following their own Respiratory Protection Program, as applicable.

The hazard assessment, use of specific protective equipment, and monitoring associated with each field work task of the remedial actions to be conducted at the Site are presented in following subsections.

5.2 Media Sampling

5.2.1 Soil Sampling

The remedial actions will involve soil excavation and soil sampling. The potential hazards to personnel during this work are dermal contact and inhalation hazard. Level D protection should be sufficient to protect against dermal contact during handling of soil and groundwater (if encountered). If organic vapors are present in ambient air at the action levels presented in Section 5.5, on the basis of organic vapor monitoring of the work area, it may be necessary to upgrade to Level C respiratory protection.

5.3 Subsurface Work

Remedial action will include excavation and temporary staging and/or direct load-out of fill/soil for off-site disposal, collection of post-excavation end-point samples, and backfilling with NYSDEC-approved material.

The potential hazards to personnel during this work are dermal contact. Level D protection should be sufficient to protect against dermal contact during handling of the subsurface soil or groundwater (if encountered). If organic vapors are present at the action levels presented in Section 5.5, on the basis of organic vapor monitoring of the work area, it may be necessary to upgrade to Level C respiratory protection.

5.4 Air Monitoring

During ground intrusive activities and activities outlined in section 5.3, the ambient air in the work area will be monitored with a photoionization detection (PID) meter (total volatile compounds – MiniRAE 3000 or equivalent) prior to the start of work and periodically as subsurface activities are conducted or as conditions warrant.

If a concentration of 10 ppm (sustained for 5 minutes) of total volatile compounds are detected within the work area on the instrument, relative to an isobutylene standard (used to calibrate the instrument), work will cease immediately, and the workers shall shut down equipment and leave the area immediately. The level of personal protective equipment (PPE) protection will be evaluated prior to continuing work. If a PPE upgrade to Level C is required, it will include: a half face air purifying respirator equipped with combination organic vapor and particulate cartridges for 10-15 ppm exposure levels; and a full-face air purifying respirator for greater than 15 ppm to less than 50 ppm exposure levels, prior to continuing work. If a concentration greater than 15 ppm is encountered, work will cease immediately, and the situation will be evaluated prior to continuation of work. Table 1 summarizes the action levels relative to the required respiratory protection.

Table 1
C.T. Male Action Levels & Required Respiratory Protection

Action Level	Level of PPE	Type of Respiratory Protection
0-10 parts per million	Level D	No respiratory protection
10-15 parts per million	Level C	Negative pressure half-face respirator

15-50 parts per million	Level C	Negative pressure full-face respirator
Greater than 50	Cease Work	Evaluate work procedures

- Facial hair is not permitted while wearing most respirators.
- Workers required to wear a respirator must have a minimum of OSHA 40 Hour training with current medical monitoring and fit test documentation.

5.5 Community Air Monitoring Plan

A Site-specific Community Air Monitoring Plan (CAMP) will be followed for the project based on the New York State Department of Health Generic Community Air Monitoring Plan dated May 2010, included as Attachment D in the Remedial Action Work Plan. The CAMP will be followed during ground intrusive remedial activities (i.e., excavation, sample collection or waste characterization purposes, etc.). The intent of the CAMP is to provide a measure of protection for the downwind community (i.e., off-Site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the RA. The CAMP is not intended for use in establishing action levels for worker respiratory protection. The CAMP will monitor the air for dust (particulate air monitoring, see Section 5.6.1) and volatile organic compound vapors (VOC air monitoring, see Section 5.6.2) at the downwind perimeter of the work area. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

5.5.1 Particulate Air Monitoring

Two (2) real-time particulate monitors capable of continuously measuring concentrations of particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) will be utilized. The instruments will be placed inside environmental enclosures at temporary monitoring stations based on the prevailing wind direction each workday, one (1) upwind and one (1) downwind of the designated work areas.

Each particulate monitor may be equipped with a telemetry unit capable of transmitting real-time particulate data to the field representative or will be monitored at regular intervals. The particulate monitoring instruments will be capable of displaying and transmitting the short-term exposure limit (STEL) or 15-minute averaging period, which will be compared to the NYSDOH Generic CAMP action

levels for particulates, as listed below. The instruments are programmed to alarm at preset action levels. At the end of each day, the readings for each instrument will be downloaded to a computer for electronic storage and retained for future reference and reporting.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that the downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, the downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped, and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

In the event of poor weather such as heavy rain, particulate monitoring will not be performed for protection of instrumentation. These weather conditions would limit the effectiveness of the sensitive monitoring equipment and likely suppress particulate generation. Work activities will be halted if fugitive dust migration is visually observed for a sustained period of time during poor weather conditions.

5.5.2 Volatile Organic Compound Air Monitoring

C.T. Male will continuously monitor for volatile organic compounds (VOCs) at the downwind perimeter of the immediate work areas with a MiniRAE 3000 VOC monitor (or equivalent) , using a 10.6 eV lamp. The VOC monitor will be placed in the downwind environmental enclosure containing a particulate monitor. The downwind VOC monitor will be equipped with a telemetry unit capable of transmitting real-time VOC data to the field representative. The VOC monitoring instrument will be capable of displaying and transmitting the short-term exposure limit (STEL) or 15-minute averaging period, which will be compared to the NYSDOH Generic CAMP action levels for VOCs, as listed in the bulleted list below. The

downwind VOC STEL readings will be downloaded to a computer for electronic storage and retained for future reference and reporting.

Upwind VOC STEL concentrations will be measured at the start of the workday, and periodically thereafter, employing a handheld MiniRae 3000 VOC monitor to evaluate the Site's background conditions. The upwind VOC STEL readings will be manually recorded for future reference and reporting.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. Work activities will then be evaluated to determine the source of the organic vapors and the engineering controls required to reduce/eliminate the organic vapors.

5.6 Hazard Identification and Control

As per C.T. Male health and safety programs, all personnel on Site will need to be in Level D (Hi-Vis reflective safety vest, safety glasses, hard hat, safety shoes, protective clothing, protective gloves, and hearing protection-if needed), at a minimum, while in work areas. The potential hazards to personnel during this work are dermal contact and inhalation hazards. Level D protection adequately protect against dermal contact and inhalation hazards during the proposed activities.

If a level of safety is required above Level D (e.g., Level C), the PM or FSM and SHSO will need to approve the work commencing. If a level of safety is determined to be at Level A or B, C.T. Male will stop work and re-assess the situation.

Roadway Work

Work on the shoulder of the roadways and high traffic areas (i.e., parking lots), may subject personnel to vehicular traffic. When feasible, work will be conducted behind barriers such as work vehicles, cones, or signs and field personnel will wear Class 2 reflective vests. The type of vest may change based upon day or night conditions and traffic speeds.

Biological Hazards

During the Site walk through for the project task, the area will be screened for biological hazards. The most common hazards anticipated are discussed below.

Insects

Bees, wasps, yellow jackets, spiders, snakes, and mosquitoes, etc. may be a potential hazard on this project, especially so for those individuals sensitized to those bites or stings. Protection methods against insects may be employed, such as the use of protective clothing or insect repellents and training in recognition and identification of harmful insects.

Potential Hazards and Control

The following table presents generalized hazards potentially involved with the tasks to be completed on this project. Table 2 identifies general procedures to follow to prevent or reduce accident, injury or illness. Any worker on-site who identifies a potential hazard must report the condition to the SHSO or designee, and initiate control of the hazardous condition.

Table 2
Potential Hazards and Control

Potential Hazard	Control
Vehicular Traffic	1. Wear Hi-Vis safety vest when vehicular hazards exist. 2. Use cones, flags, barricades, and caution tape to define work area.

Table 2 Potential Hazards and Control	
Potential Hazard	**Control**
	3. Use vehicle to block work area. 4. Use vehicle caution lights in high traffic areas within the Site. 5. Contact local police for high traffic situations on public roadways.
Slip, Trip, and Fall Protection	1. Assess work area to determine if there is a potential for falling. Additional PPE can be utilized to reduce slip, trip, fall hazards. When walking through grassy areas, be vigilant of any holes dug on-Site by animals such as woodchucks (have been observed at the Site in the past) which are a trip/fall hazard. 2. Make sure work area is neat and tools are staged in one general area. 3. Wear appropriate footwear based on site conditions and requirements. Watch where the individual is walking. Carry flashlight when walking in poorly lighted areas.
Inclement Weather	1. Stop outdoor work during electrical storms and other extreme weather conditions such as extreme heat or cold temperatures. 2. If there is lighting or thunder, staff need to stop work for 30 minutes since last occurrence and take cover in a safe location. Not in a field or under a tree. 3. Take cover indoors or in vehicle. 4. Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
Utility Lines Contact	1. Have the subcontractor contact UDigNY or New York 811 to have utility lines marked prior to any underground excavation, trenching or drilling. The subcontractor must contacted UDig at least 72 hours prior to work. 2. Conduct onsite utility mark out by a subcontractor, if needed. 3. Refer to Site drawings for utility locations. 4. Pre-clear the utility. Refer to the guidance on clearance from UDigNY or New York 811. 5. Complete the C.T. Male Subsurface Exploration checklist prior to initiating on Site activities.
Noise	1. Wear hearing protection when exposed to noise levels above 85 decibels, which includes equipment such as a drill rig, excavator, jackhammer, boat

Table 2 Potential Hazards and Control	
Potential Hazard	**Control**
	motor, woodchipper, chainsaw, or other heavy equipment is operating on-site. 2. Wear hearing protection whenever you need to raise your voice above normal conversational speech due to a loud noise source; as this much noise indicates the need for protection. 3. Hearing protection is required when measured sound exceeds 85 decibels (dB) where employees stand or conduct work.
Electrical Shock	1. Maintain appropriate distance between heavy equipment and overhead utilities; 20-foot minimum clearance from power lines; and 10-foot minimum clearance from shielded power lines. 2. Have the subcontractor contact local underground utility locating service prior to penetrating the ground surface.
Hand and Power Tools	1. Ensure cords to tools are not frayed and are properly grounded. 2. Ensure guards for power tools are in place (such as portable circular saw) as recommended by the manufacturer. 3. Tool cutting edges are kept in proper condition so the tool will operate properly. 4. Worn or bent tools are not to be used. Tool handles must be secure. 5. When not in use, tools are stored in a dry, secure location. 6. Ensure proper PPE use with hand and power tools. Cut or puncture resistant gloves, or work gloves to provide protection may be used. Check with OSHO or FSM or PM prior to use of the power tools. 7. If a generator is used with the power tools, ensure there is proper ventilation for the generator.
Physical Injury	1. Wear safety glasses, reflective Hi-vis safety vest and/or shirt always when on-site. Personnel to have hearing protection on them and in use when it is required. 2. Maintain visual contact with any equipment operators and wear hard hats and Hi-vis safety vest when heavy equipment is operating on-site. Be aware of other vehicle traffic while heavy machinery is operating on-site. 3. Avoid loose clothing, long hair, and jewelry when working around rotary equipment.

Table 2 Potential Hazards and Control	
Potential Hazard	**Control**
	4. Keep hands and feet away from drilling augers, excavation equipment tracks/tires, and other on-site heavy equipment. 5. Test emergency shut-off switches on equipment prior to daily use. 6. Wear life preserver in boats. 7. Do not enter manholes or confined spaces. 8. Be aware of openings into manholes and keep area clear of trip hazards. 9. Be aware of outside terrain – steep slopes and slip, trip hazards while working. 10. Be aware of biological hazards on-site such as insects (bees, mosquitoes, and flies), ticks, spiders, and snakes. 11. Be aware of botanical hazards such as poison ivy, poison sumac, and giant hogweed.
Back Injury	1. Use a mechanical lifting device or a lifting aid where appropriate. 2. Ensure the route is free of obstructions. 3. Bend at the knees and use leg muscles when lifting. 4. Use the buddy system if lifting heavy or awkward objects. 5. Do not twist or jerk your body when lifting.
Heat Stress	1. Increase consumption of water and electrolytes while working. 2. Avoid excessive alcohol intake the night before working in heat stress situations. 3. Avoid excessive caffeine intake when working in heat stress situations. 4. Increase number of rest breaks as necessary, and rest in a shaded area. 5. Watch for signs and symptoms of heat exhaustion and fatigue. 6. Rest in cool, dry areas. 7. In the event of heat stress or heat stroke, bring the victim to a cool environment and call 911.
Cold Stress	1. Wear cotton, wool or synthetic (polypropylene) undergarments to absorb perspiration from the body. 2. Wear additional layers of light clothing as needed for warmth. The layering effect holds in air, trapping body heat, and some layers could be removed as the temperature rises during the day.

Table 2 Potential Hazards and Control	
Potential Hazard	**Control**
	3. Pay close attention to body signals and feelings (hypothermia symptoms), especially to the extremities. Correct any problem indicators by breaking from the work activity and moving to a rest area to warm up and add additional clothing. 4. Increase water intake while working. 5. Avoid excessive alcohol intake the night before working in cold conditions. 6. Increase the number of rest breaks as necessary, and rest in a warm area. 7. In the event of hypothermia or frost bite, bring the victim to a warm environment and call 911.
Fire Control	1. Smoking is not allowed on-site. 2. Keep flammable liquids in closed containers. 3. Isolate flammable and combustible materials from ignition sources. 4. Keep fire extinguisher nearby and use only if deemed safe. 5. Inform FSM or SHSO prior to a chemical being brought on-site. 6. Facility Hot Work permit may be required for certain tasks. "Hot work" means riveting, welding, flame cutting or other fire or spark-producing operation.
Media Sampling (water, soil, sediment, soil gas, etc.)	1. Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated media. 2. Stand upwind to minimize possible inhalation exposure, especially when opening monitoring wells or closed containers/vessels. 3. Conduct air monitoring, whenever necessary, to determine level of respiratory protection. 4. If necessary, employ engineering controls to assist in controlling chemical vapors. 5. When collecting samples on or near water bodies, wear a life jacket and employ the buddy system. 6. When collecting samples from water bodies, assess water conditions and the water current and ensure that the sampling vessel is stabilized, or the water is safe to enter.

Table 2 Potential Hazards and Control	
Potential Hazard	**Control**
Cleaning Equipment	1. Wear appropriate PPE to avoid skin and eye contact with Alconox or other cleaning materials. 2. Stand upwind to minimize possible inhalation exposure. 3. Properly dispose of spent chemical cleaning solutions and rinse accordingly.
Deer Ticks	1. Wear long pants and long sleeve shirts. Pants could be tucked into the top of socks at boot level. Shirt tucked into pants. 2. Wear insect repellant clothing, if available. See SHSO for appropriate clothing. 3. Use tick repellent, this will need to be cleared with OSHO or SHSO to ensure that new chemicals are not introduced to the Site. 4. Perform personal body checks for the presence of ticks, after field work is complete and before the personnel have left the Site. 5. Notify the OHSO immediately if you have been bitten by a tick or discovered a tick on yourself.
Note: A first aid kit and fire extinguisher will be located in the C.T. Male company vehicle.	

Response actions to personal exposure from on-site contaminants include skin contact, eye contact, inhalation, ingestion, and puncture or laceration. The recommended response actions are presented in Section 11.2.

5.7 Airborne Infectious Disease Plan and COVID-19

C.T. Male COVID-19 & Airborne Infectious Disease

C.T. Male will follow applicable CDC, OSHA, New York State, and Local authorities for COVID-19 and other related infectious diseases. To address work Site safety regarding infectious disease exposure (including COVID-19), C.T. Male personnel will follow C.T. Male Associates 'Airborne Infectious Disease Exposure Prevention Plan' dated August 5, 2021. This plan would be followed when an airborne infectious disease is designated by the NYS Health Commissioner as a highly contagious communicable disease that presents a serious risk of harm to the public health.

For field activities, C.T. Male shall follow C.T. Male's SOP – 'Procedures for field staff in relation to COVID-19 or other virus', dated March 19, 2020, when applicable.

In addition to the above referenced Plan and SOP, C.T. Male employees will not report to work and notify their supervisor immediately if they are experiencing illness such as fever, cough, shortness of breath or difficulty breathing, chills, repeated shaking with chills, muscle aches, sore throat, loss of taste or smell, or runny/stuffy nose.

C.T. Male will also:

- Make effort to hold safety/tailgate meetings outdoors; maintain social distancing of six feet;
- Avoid sharing tools and equipment without cleaning and disinfecting;
- Avoid touching their eyes, nose and mouth with unwashed hands;
- Cover their cough or sneeze with a tissue, then throw the tissue in the trash;
- Clean and disinfect frequently touched objects and surfaces using a bleach solution or wipe;
- Wash their hands often with soap and water for 20 seconds, and use an alcohol-based hand sanitizer that is 60% alcohol when soap and water are unavailable;

6.0 TRAINING

The C.T. Male OSHA and SHSO will provide training to specifically address the activities, procedures, monitoring and equipment for the Site operations. It will include area and facility layout, hazards, emergency services (police, hospital, fire, etc.), and review of this HASP. Questions by workers, field personnel, etc. will be addressed at this time.

Workers and personnel conducting and/or supervising the project must have attended and successfully completed a 40 Hour Health and Safety Training Course for Hazardous Waste Operations and an annual 8-hour Refresher Course. Workers must take part in an employer medical surveillance program in accordance with OSHA 1910.120 requirements, including that the workers have had a medical physical within one (1) year prior to the date work begins and that they are physically able to wear a respirator.

Documentation of training and medical surveillance will be submitted to the OSHO or designee prior to the start of any on-site work. A copy of the training certificates shall be maintained by the OSHO and Human Resources Department at the C.T. Male Latham office.

7.0 SITE ACCESS

Remedial Action Site work (decommissioning of monitoring wells; soil excavation and backfill; sample collection, etc.) will be performed within the Site boundaries. Vehicular traffic will enter and exit the Site along designated entrance(s) (to be determined).

During the remedial action, the General Contractor supplies and equipment will likely be staged on different areas of the Site dependent on which areas of the Site are being remediated at any given time. Therefore, based on vehicular ingress/egress (to be determined), contractor staging areas and the work area locations, the work area will be considered anywhere within the boundaries of the Site.

Only OSHA trained employees of C.T. Male that are qualified to do the work of the Environmental Consulting Engineer and have read and signed this HASP will be allowed within the work/exclusion zone (see definition below). Pertinent contractors and subcontractors entering into the work area will follow their own HASPs and will have the necessary training for the work that they are performing. Temporary fencing/hazard tape will be installed around open excavations after hours when C.T. Male or the contractor is not on Site. The Contractor will be responsible for preventing and/or limiting unauthorized individuals from entering the Site during normal work hours.

The Contamination Reduction Zone (decontamination area), and Support Zone (clean area) shall be established outside the work area as necessary. The work/exclusion, contamination reduction and support zone during the RA work have been identified and designated as follows:

Work/Exclusion Zone - The location of the work/exclusion zone will be determined in the field prior to the start of work and will vary depending on the work activities conducted. For the most part, the work/exclusion zone is anticipated to be approximate 20 foot radius around the daily work area and defined with caution tape and cones (see above, or equal method), when applicable. Only authorized persons with proper training and protective gear will be allowed to enter the work/exclusion zone.

Contamination Reduction Zone – If applicable, this zone will generally be a 10'± by 10'± area containing decontamination related supplies and equipment (decontamination station). The size of the work zone may be adjusted based on Site conditions or restraints. The location will be determined prior to the start of work and may vary depending on the area(s) the work is being conducted. This zone is where decontamination of personnel and equipment will take place, as necessary, on the basis of the work being performed, and temporary storage of Investigation Derived Wastes (IDW).

Support Zone - Area outside of the contamination reduction zone; not including the work/exclusion zone. Unauthorized or untrained individuals must remain in this zone.

8.0 PERSONAL PROTECTION

8.1 Level of Protection

Based on an evaluation of the potential hazards, the minimum level of protection to be worn by workers during implementation of the remedial activities is defined as Level D protection and will be controlled by the OHSO, SHSO or designee.

The minimum level D protective equipment will consist of field clothes, Hi-Vis shirts or vests, rubber and/or nitrile gloves, safety glasses, hard hats, face covering as applicable (Airborne Infectious disease/COVID-19), and safety boots (steel or composite toe). As appropriate, this level of protection may be modified to include ear plugs, protective suits, coveralls, leg chaps, or face shield for additional protection.

If required, level C protective equipment will consist of the items listed for Level D protection with the added protection of a half face air purifying respirator or a full-face air purifying respirator equipped with combination organic vapor and particulate cartridges, chemical resistant clothing, inner and outer chemically resistant gloves (i.e., nitrile and/or PVC), and chemical resistant safety over boots. Prior to field staff donning a respirator, C.T. Male Project Manager and OSHO will need to approve the use of the respirator, cartridges and staff donning them. Staff that have medical clearance and have been fit tested, should have their full-face or half-face air purifying respirators available. Appropriate combination organic vapor and particulate cartridge filters will be available at the Site to use, if necessary, with the air purifying respirators.

Level A or B is not anticipated, but if required, level B protective equipment will consist of the items listed for Level D protection except a self-contained breathing apparatus (SCBA) will be worn dependent on the level of contaminants present in the work zone, and protective suits will be required. When Site conditions warrant the need for level A or B protective equipment, work will cease, and the project will be re-evaluated to determine the necessity for eliminating the condition, employing engineering controls to reduce the potential contaminants of concern. C.T. Male staff are not approved for donning SCBA equipment.

8.2 Safety Equipment

Basic emergency and first aid equipment will be available at an area within the Support Zone clearly marked and available or within C.T. Male company vehicle. This shall include, at a minimum, a first aid kit, fire extinguisher, supply of potable water (if not available on-site or not in an appropriate distance), soap, towels, face covering, Clorox wipes or bleach solution. Extra PPE will also be kept in the work area, or within C.T. Male company vehicle. The SHSO or designee shall be equipped with a cellular phone in case of emergencies.

9.0 COMMUNICATIONS

The SHSO or designee shall notify the C.T. Male Project Manager and OSHO as soon as safely possible in the event of an accident, injury, or emergency action.

Hand signals for certain work tasks will be employed, as necessary, and the buddy system will be employed, when feasible for Site investigation activities.

10.0 DECONTAMINATION PROCEDURES

10.1 Personnel Decontamination Procedures

Decontamination procedures will be carried out by all personnel leaving the Work/Exclusion Zone (except under emergency evacuation). The amount of decontamination performed will be dependent on the level of personal protection currently being worn within the exclusion zone.

1. Do not remove respiratory protection (if applicable) until all steps have been completed.
2. Clean outer protective gloves and outer boots, if worn, with water (preferably with a pressurized washer) over designated wash tubs in the exclusion zone to remove the gross amount of contamination.
3. Deposit equipment used (tools, sampling devices, and containers) at designated drop stations - on plastic drop sheets or in plastic lined containers. If disposable equipment is used, it can be discarded in the designated container.
4. Rinse outer boots if worn and gloves with clean water in designated rinse tubs. Remove outer boots if worn and gloves and deposit in designated area to be determined in the field for use the next day or when necessary. If disposable outer boots are worn, remove and discard in designated container.
5. Remove protective suit, if worn, and discard in designated container. If ear plugs were used, they can be discarded in designated container. Remove respirator at this time, if used; wash and rinse with clean water. Organic vapor and particulate cartridges, when used, will be replaced daily. Used cartridges will be discarded in the designated waste container. Remove inner gloves and discard in designated container.
6. Remove hard hat & safety glasses, clean with Clorox wipes or Clorox bleach solution (or similar) prior to placing into C.T. Male vehicle.
7. Prior to entering the C.T. Vehicle, ensure that C.T. Male SOP for field staff in relation to COVID-19 is followed, if applicable.

10.2 Equipment and Sample Containers Decontamination

All decontamination will be completed by personnel in protective gear appropriate for the level of protection determined by the SHSO or designee. Manual sampling equipment including scoops, hand augers, and shovels which come into contact with the Site's soils or groundwater (if generated) will be cleaned with a tap water (or filtered water)/detergent wash and a tap water (or filtered water) rinse. The sampling equipment will be decontaminated after each sample is collected at the Contaminant Reduction Zone (Decontamination Station). The sampling equipment wash, and rinse water (if generated in significant quantities warranting containerization) will be captured in plastic pails or tubs and ultimately transferred to labeled appropriate storage containers(s) (e.g.: DOT 17H approved 55-gallon open top steel drums or frac tank) and staged on-site at a secure location.

Drill rig equipment (i.e., casing, drill rods, bits, core samplers) which comes into contact with the Site's soils or groundwater (if generated) will be decontaminated with hot water wash and/or other methods within the Contaminant Reduction Area. Larger equipment (i.e., drill rig) which comes into contact with the Site's soils will be decontaminated with hot water wash and/or other methods within a decontamination area. If performed during investigative activities, the cleaning will be performed at the completion of each boring location. During investigative activities, equipment decontamination wastes will be transferred to labeled appropriate storage containers and staged on-Site at a secure location (if generated in large quantities warranting containerization).

Excavation equipment (i.e., rubber-tire backhoe or track excavator) which comes into contact with the Site's soils or groundwater will be decontaminated with a high pressure/hot water wash or utilizing dry decontamination methods (i.e., brushing of tires/tracks to removed adheres soils). Prior to the equipment being demobilized from the Site or prior to entering remediated areas of the Site, the equipment will be decontaminated in a manner that removes adhered fill/soils and residues. Fill/soils and residues generated from the decontamination procedures will be disposed of with the impacted fill/soil mixtures at the approved off-site disposal facilities. The decontamination procedure will focus on portions of the equipment that has come into contact with the Site's soils or groundwater (if generated) such as the bucket, tracks and tires. The cleaning will be performed at the completion of excavation

activities and the used cleaning liquids (if generated) will be stored in DOT approved containers for characterization and off-site disposal at a permitted disposal facility (if generated in large quantities warranting containerization).

Trucks entering and exiting the Site will be subject to the requirements of the Site specific erosion and sediment control measures outlined in the RWP and site specific Stormwater Pollution Prevention Plan (SWPPP), which shall include the requirements of a stabilized construction entrance to mitigate fill/soil from being tracked off-site and onto roadways. The public roadway(s) where trucks exit the Site will be monitored by the Remediation Engineer's field representative. If fill/soil tracking is observed, improvements to the erosion and sediment controls and fill/soil loading procedures will be required and implemented. Trucks entering and exiting the Site will also conform to the Site's State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity.

Exterior surfaces of sample containers, when utilized, will be wiped clean with disposable paper towels in the decontamination zone and transferred to a clean cooler for transportation or shipment to the analytical laboratory. Sample identities will be noted and checked off against the chain-of-custody record. The disposable paper towels will be placed in the designated disposal container and disposed of as solid waste.

11.0 EMERGENCY RESPONSE PROCEDURES

THE PROJECT EMERGENCY COORDINATORs ARE:

Project Manager (PM)	Jim McIver 845.454.4400 (O) 845.594.1788 (C)
Project Environmental Engineer	Rosaura Andújar-McNeil 845.454.4400 (O) 347.232.1919 (C)
Field Services Manager (FSM)	Jonathan Dippert 518.786.7563 (O) 518.469.1183 (C)
Office Health and Safety Officer (OHSO)	Nancy Garry 518.786.7541 (O) 518.320.5783 (C)
Site Health and Safety Officer (SHSO)	To be determined based upon work task being completed.

The following standard emergency procedures will be used by on-Site personnel. The PM, Project Environmental Engineer, FSM and OHSO shall be notified of any on-Site emergencies and be responsible for assuring that the appropriate procedures are followed.

IN THE EVENT OF AN EMERGENCY DIAL 911

11.1 Personal Injury

In the event of an Emergency situation, dial 911. Emergency first aid shall be administered on-Site as deemed necessary and only by a trained individual, if available at the Site. If a trained individual is not available on-Site, decontaminate if feasible, and transport individual to nearest medical facility (St. John's Riverside Hospital). If feasible, the injured individual shall not transport themselves to the nearest medical facility. The SHSO or Project Manager will be responsible for completing the incident report in conjunction with the employee.

11.2 Personal Exposure

The recommended response to worker exposure from contaminants on-Site includes the following:

SKIN CONTACT: Use generous amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention, as necessary.

EYE CONTACT: Wash eyes thoroughly with potable tepid water supply provided on-site. Eyes should be rinsed for at least 15 minutes subsequent to chemical contamination. Provide medical attention, as necessary.

INHALATION: Move worker to fresh air and outside of the work zone and/or, if necessary, decontaminate and transport to hospital (St. John's Riverside Hospital). If respirator use is implemented at the time of inhalation, worker must not remove respirator until completely away from the work zone.

INGESTION: Decontaminate, if feasible, and transport to hospital (St. John's Riverside Hospital).

PUNCTURE WOUND OR
LACERATION: Provide first aid at the Site and if wound needs medical attention, decontaminate, if feasible, and transport to hospital (St. John's Riverside Hospital).

If the affected worker is exposed to contaminants on-Site and the injury or accident prevents decontamination of the individual, the emergency responders must be notified of this condition and the exposure must be kept to a minimum.

11.3 Potential or Actual Fire or Explosion

Immediately evacuate area in the event of potential or actual fire or explosion and dial 911. Notify the local Fire and Police Departments, and other appropriate emergency response groups as listed in Section 1.2. Perform off-site decontamination and contain wastes for proper disposal. If a fire or explosion occurs, all on-site

personnel must meet in the designated area of the Site (established by the SHSO or designee – prior to work starting and relayed to Site workers) for an accurate head count.

11.4 Equipment Failure

Should there be any equipment failure, breakdown, etc. the Project Manager, Field Services Manager or SHSO shall be contacted immediately. There will be a concerted effort to replace or repair the equipment in a timely manner.

11.5 Spill Response

The SHSO or designee shall initiate a corrective action program with the subcontractors in the event of an accidental release of a hazardous material, suspected hazardous material or petroleum. The SHSO or designee work with the General Contractors Emergency Coordinator and with the subcontractors for the purposes of spill prevention; identifying releases; implementing clean up measures; and notification of appropriate personnel.

The corrective action program will be implemented by the Project Manager or SHSO or designee and subcontractor to effectively control and minimize any impact accidental releases may have to the environment.

Effective control measures will include:

- Preliminary assessment of the release.
- Control of the release source.
- Containment of the released material.
- Effective clean-up of the released material.

Potential sources of accidental releases include hydraulic oil spills or petroleum leaks from heavy equipment; cooling oils (potentially PCB containing) for electrical equipment handling and cleaning; and spills from drums and tanks. The SHSO or designee in conjunction with the General Contractors and subcontractors shall respond to an accidental release in the following manner:

- Identify the character, source, amount, and area affected by the release.
- Have subcontractor take all reasonable steps to control the release.
- Notify Project Manager and Field Services Manager.

- Notify Site Contact for CPG Phase VI Limited Partnership.
- Notify the NYSDEC Spill Hotline at 1-800-457-7362 if required.
- Contain the release with sorbent material which should include speedy-dry, spill socks and sorbent pads.
- Prevent the release from entering sensitive receptors (i.e., catch basins and surface water) using the specified sorbent material or sandbags.
- Coordinate cleanup of the released material.
- Oversee proper handling and storage of contaminated material for disposal.

At no time should personal health or safety be compromised or jeopardized in an attempt to control a release. All health and safety measures as outlined in this HASP should be adhered to.

12.0 ADDITIONAL WORK PRACTICES

Workers will be expected to adhere to the established safety practices. Work on the project will be conducted according to established protocol and guidelines for the safety and health of all involved. The following will be adhered to:

- Employ the buddy system when possible, and for those work tasks which require it. Establish and maintain communications.
- Minimize contact with potentially contaminated soil, soil gas and groundwater.
- Employ disposable items, when possible, to minimize risks during decontamination and possible cross-contamination during sample handling.
- Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed.
- Avoid heat and other work stress related to wearing personal protective equipment. Take breaks as necessary and drink plenty of fluids to prevent dehydration.
- Withdrawal from a suspected or actual hazardous situation to reassess procedures is the preferred course of action.
- The removal of facial hair prior to working on-site will be required to allow for a proper respiratory face piece fit.
- The PM, SHSO, and field personnel shall maintain records recording daily activities, meetings, facts, incidents, data, etc. relating to the project. These records will be electronically available during the full duration of the project so that replacement personnel may add information while maintaining continuity.

13.0 AUTHORIZATIONS

Personnel authorized to enter the exclusion zone at the Site while operations are being conducted must be certified by the PM, OHSO or SHSO. Authorization will involve completion of appropriate training courses and review and sign off this HASP.

Personnel authorized to perform work on-site are as follows:

Company Representing	Written Name
C.T. Male	Jim McIver, Kirk Moline, Jeffrey Marx, Steve Bieber, Rosaura Andújar-McNeil, Mary Loughlin, Dan Reilly, Jon Dippert, Eric White, Dan Achtyl, Chris Ormsby, Cliff Bondi, Nathan Roberts, Ryan Hubbard, Brittany Taranto, Nancy Garry, Jorel Spain, Adam Rodgers

14.0 FIELD TEAM REVIEW

Each field team member shall sign this section after Site specific training is completed and before being permitted to work on-site.

I have read and understood this Site-Specific Health and Safety Plan, and I will comply with the provisions contained therein.

PROJECT: Remedial Action
Former Plesser Property Site
55 Paradies Lane
Town of New Paltz
Ulster County, New York

Name: Printed	Signature	Date

FIGURE 1

SITE LOCATION MAP

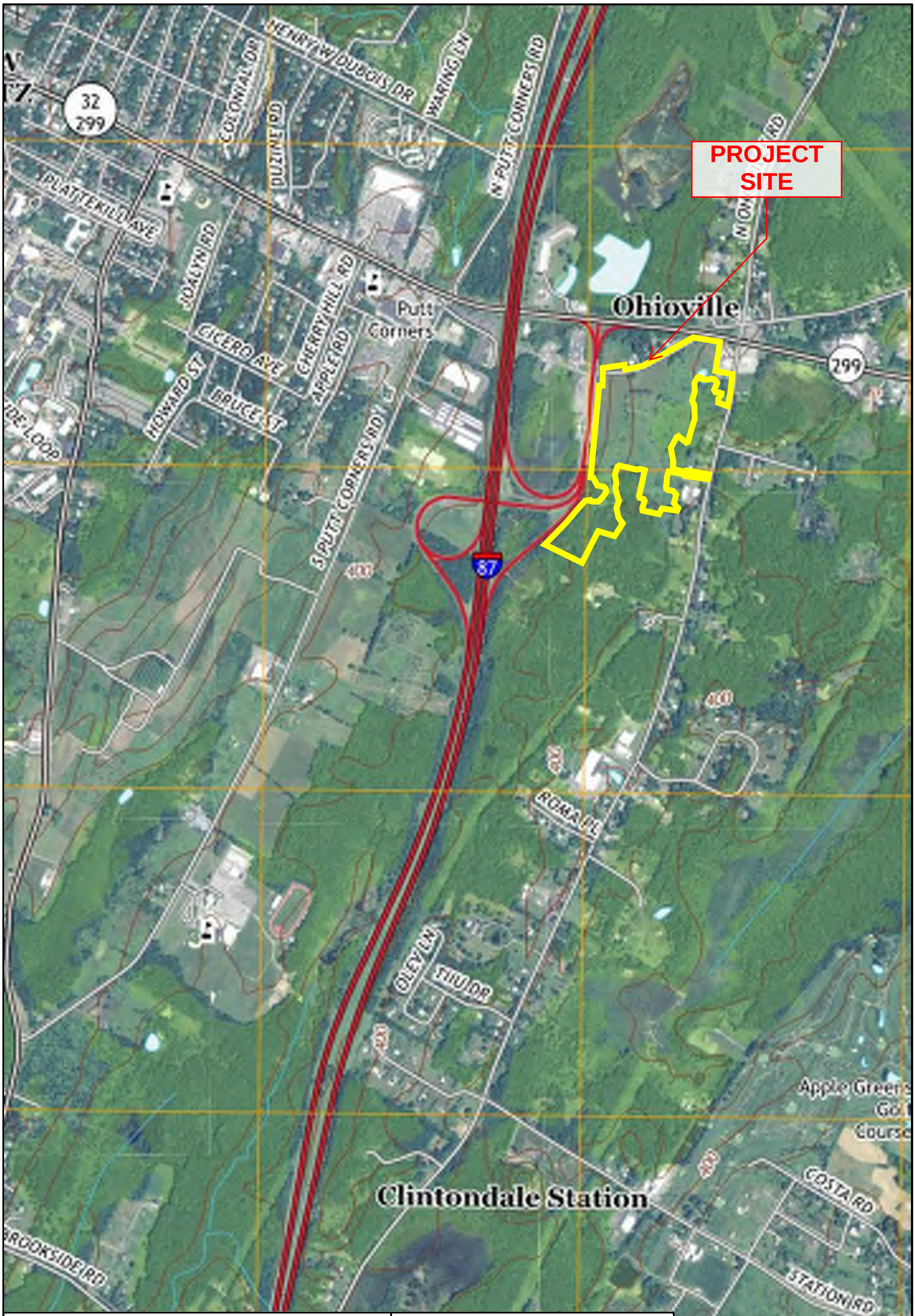


Figure 1: Site Location Map

Town of New Paltz — **Ulster County, New York**

Legend

Approximate Site location Boundary

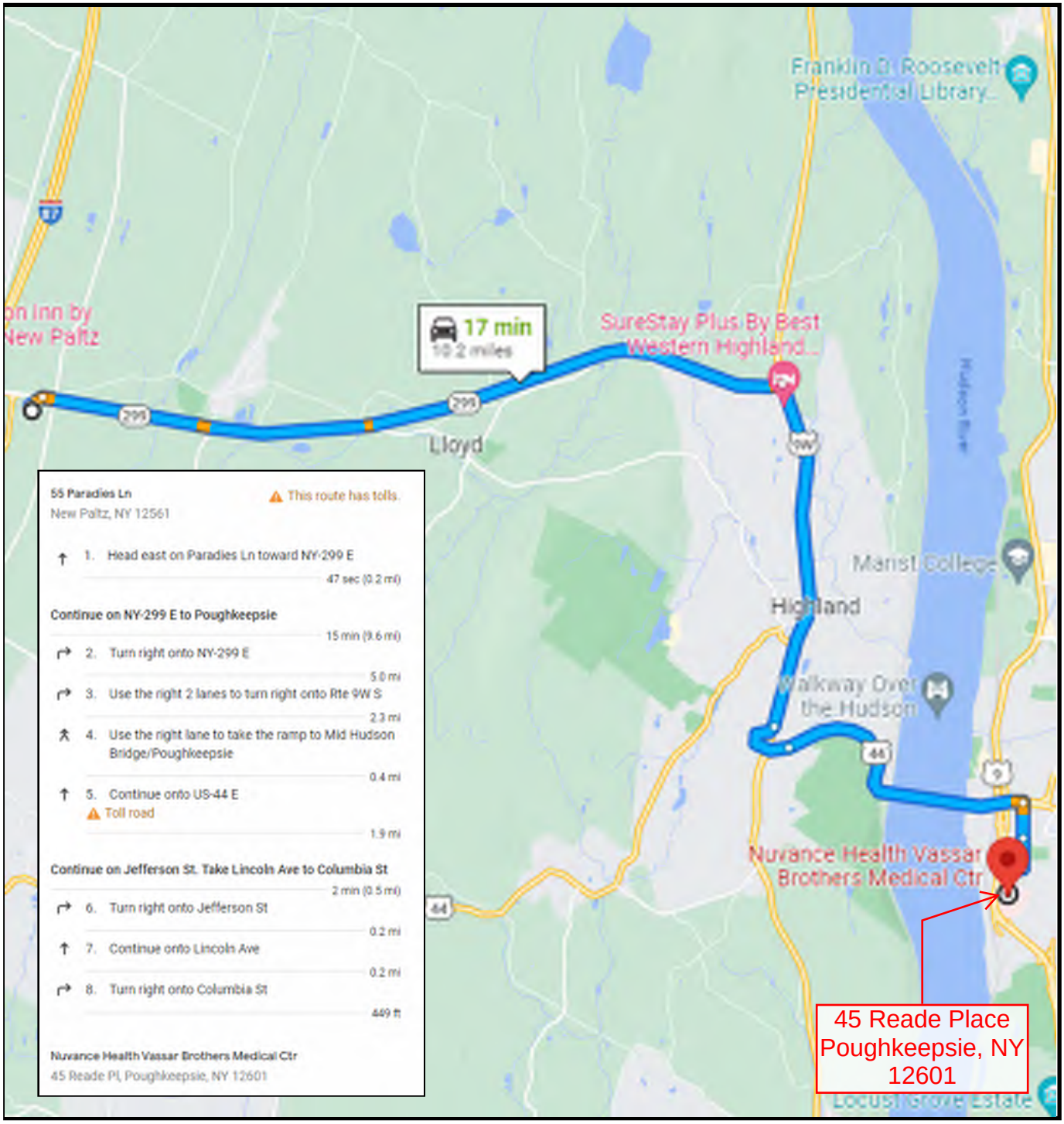
Map Note: The locations and features depicted on this map are approximate and do not represent a field survey.

Project Number: 15.5056
Data Source: NYSGIS Clearinghouse
Projection: State Plane NAD83 NYE (Feet)
Date: May 14, 2018
File: Fig1_SiteLocationMap2018_11x17.mxd
GIS: C Secor

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

FIGURE 2

MAP SHOWING ROUTE TO THE HOSPITAL



MAP REFERENCE

Google Map Images (accessed October 6, 2023).

N

C.T.MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE
LANDSCAPE ARCHITECTURE & GEOLOGY, D.P.C.

50 CENTURY HILL DRIVE
LATHAM, NY 12110

FIGURE 2 - ROUTE TO HOSPITAL

TOWN OF NEW PALTZ	ULSTER COUNTY, NY
SCALE: NOT TO SCALE	The locations and features depicted on this map are approximate and do not represent an actual survey.
DRAFTER: ML	
PROJECT No.: 23.3070	

APPENDIX E

REQUEST TO IMPORT/REUSE FILL OR SOIL FORM

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

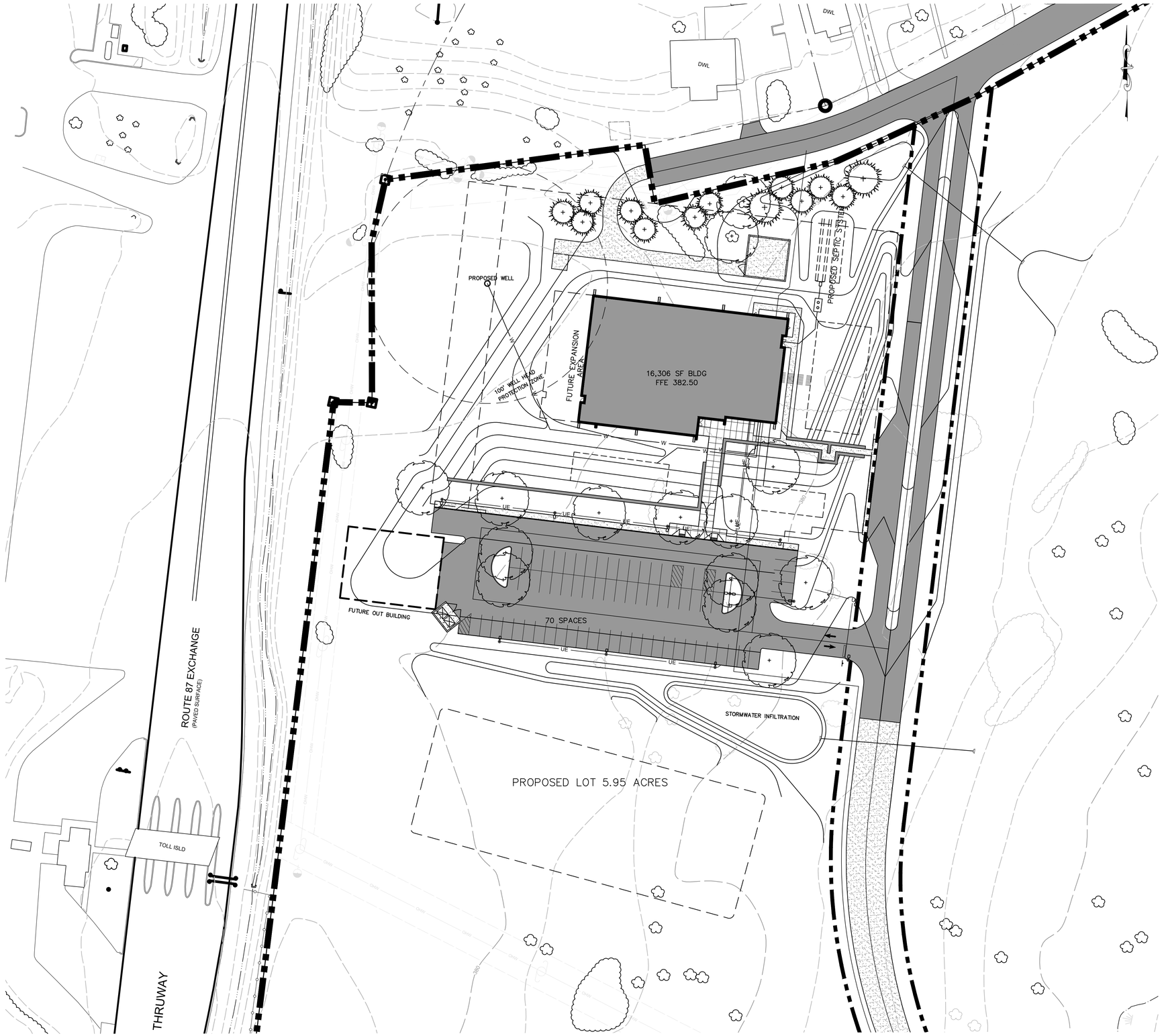
_____

Firm

Revised April 2023

EXHIBIT 1

SITE PLAN



SITE PLAN LEGEND:

- PROPOSED BUILDINGS
- FUTURE EXPANSION AREAS
- PROPOSED LIMITS OF DISTURBANCE
- ROAD CENTERLINE
- TIMBER BARRIER RAIL
- CHAIN LINK FENCE
- STORMWATER MANAGEMENT AREA
- PROPOSED MAINTENANCE EASEMENT
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE SIDEWALK
- (64) PARKING COUNT
- (1) SIGN DESIGNATION

3 February 2023 1:01 PM

ULSTER COUNTY

GOVERNMENT OPERATIONS CENTER

STREET ADDRESS
KINGSTON, NY 12000

ARCHITECT
URBAHN ARCHITECTS
306 WEST 37TH ST, NEW YORK, NY 10018
www.urbahn.com

ARCHITECT
ALFANDRE ARCHITECS www.alfandre.com
231 MAIN STREET, SUITE 201, NEW PALTZ, NY 12651

CIVIL - MECH- ELEC - PLUMBING - FP ENGINEER
GPI www.gpinet.com
80 WOLF ROAD, SUITE 300, ALBANY, NY 12205

SPECIALTY SYSTEMS
CERAMI ASSOCIATES www.ceramiassociates.com
1001 AVENUE OF THE AMERICAS, NEW YORK, NY 10018

COST ESTIMATOR
TROPHY POINT
306 WEST 37TH STREET, 9TH FLOOR, NEW YORK, NY 10018

REVISION	DESCRIPTION	DATE

RESERVED

RESERVED

PHASE	SCHEMATIC DESIGN
PRINCIPAL IN CHARGE	DONALD E. HENRY, JR.
PROJECT MANAGER	CHRISTOPHER YOUNG
CHECKED BY JEM/CNT	UA PROJECT NO. 2117-00

DRAWING TITLE:

SCHEMATIC DESIGN PLAN PARADISE LANE

SEAL

SCALE 1" = 40'

DATE 03 FEB 2023

DRAWING NUMBER

SD-1

ULSTER COUNTY

.\seal-logo.png

GOVERNMENT OPERATIONS CENTER

STREET ADDRESS
KINGSTON, NY 12000

ARCHITECT
URBAHN ARCHITECTS
306 WEST 37TH ST, NEW YORK, NY 10018
www.urbahn.com

ARCHITECT
ALFANDRE ARCHITECS www.alfandre.com
231 MAIN STREET, SUITE 201, NEW PALTZ, NY 12651

CIVIL - MECH- ELEC - PLUMBING - FP ENGINEER
GPI www.gpinet.com
80 WOLF ROAD, SUITE 300, ALBANY, NY 12205

SPECIALTY SYSTEMS
CERAMI ASSOCIATES www.ceramiassociates.com
1001 AVENUE OF THE AMERICAS, NEW YORK, NY 10018

COST ESTIMATOR
TROPHY POINT
306 WEST 37TH STREET, 9TH FLOOR, NEW YORK, NY 10018

REVISION	DESCRIPTION	DATE

RESERVED

RESERVED

PHASE	SITE SELECTION
PRINCIPAL IN CHARGE	DONALD E. HENRY, JR.
PROJECT MANAGER	CHRISTOPHER YOUNG
CHECKED BY JEM/CNT	UA PROJECT NO. 2117-00

DRAWING TITLE:

SCHEMATIC DESIGN PLAN PARADISE LANE

SEAL

SCALE 1" = 80'

DATE 03 FEB 2023

DRAWING NUMBER

SD-2

EXHIBIT 2

USACOE JURISDICTIONAL WETLAND DETERMINATION

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278-0090

FEB 27 2015

Regulatory Branch

SUBJECT: Permit Application Number NAN-2014-01331-WOR
by Turk Hospitality Group

Robert G. Torgersen
Landscape Architecture and
Environmental Sciences
Three Main Drive
Nanuet, New York 10954

Dear Mr. Torgersen:

On October 21, 2014, the New York District of the U.S. Army Corps of Engineers received a request for a Department of the Army jurisdictional determination for the above referenced project. The site consists of approximately 57.26 acres, in the Hudson River watershed, located on South Ohioville Road in the Town of New Paltz, Ulster County, New York. The proposed project would involve the construction of a resort to be known as Wildberry Lodge.

In the letter received on October 21, 2014, your office submitted a proposed delineation of the extent of waters of the United States within the subject property. A site inspection was conducted by a representative of this office on November 19, 2014, in which it was agreed that changes would be made to the delineation and that the modified delineation would be submitted to this office. On January 7, 2015, this office received the complete modified delineation.

Based on the material submitted and the observations of the representative of this office during the site visit, this site has been determined to contain jurisdictional waters of the United States based on: the presence of wetlands determined by the occurrence of hydrophytic vegetation, hydric soils and wetland hydrology according to criteria established in the 1987 "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1 that are either adjacent to or part of a tributary system; the presence of a defined water body (e.g. stream channel, lake, pond, river, etc.) which is part of a tributary system; and the fact that the location includes property below the ordinary high water mark, high tide line or mean high water mark of a water body as determined by known gage data or by the presence of physical markings including, but not limited to, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter or debris or other characteristics of the surrounding area.

These jurisdictional waters of the United States are shown on the drawing entitled "A.C.O.E. Wetland Delineation Map Wildberry Lodge NYS Route 299 & South Ohioville Road Town of New Paltz Ulster County, New York", Drawing ACOE-1, prepared by Engineering & Surveying Properties, dated September 30, 2014, and last revised December 3, 2014. This drawing indicates that there are four (4) principal wetland areas and one (1) intermittent stream on the project site which are part of a tributary system, and are considered to be waters of the United States.

The first wetland (Wetland A) is located along the eastern portion of the property and is approximately 3.68 acres within the subject property. The second wetland (Wetland B) is located on the southern portion of the property and is approximately 5.21 acres within the subject property. The third wetland (Wetland C) is located along the western property line and is approximately 0.15 acres within the subject property. The fourth wetland (Wetland D) is located between Wetlands A and B and is approximately 0.55 acres. An intermittent stream flows from Wetland B, to Wetland D, then through Wetland A, and is approximately 0.08 acres within the subject property.

It should be noted that, in light of the U.S. Supreme Court decision (Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, No. 99-1178, January 9, 2001), the remainder of the wetlands shown on the above referenced drawing (Wetland E) do not meet the current criteria of waters of the United States under Section 404 of the Clean Water Act. The Court ruled that isolated, intrastate waters can no longer be considered waters of the United States, based solely upon their use by migratory birds.

This determination regarding the delineation shall be considered valid for a period of five years from the date of this letter unless new information warrants revision of the determination before the expiration date.

This determination was documented using the Approved Jurisdictional Determination Form, promulgated by the Corps of Engineers in June 2007. A copy of that document is enclosed with this letter, and will be posted on the New York District website at:
http://www.nan.usace.army.mil/Missions/Regulatory/JurisdictionalDeterminations/RecentJurisdictionalDeterminations.aspx

This delineation/determination has been conducted to identify the limits of the Corps Clean Water Act jurisdiction for the particular site identified in this request. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed is a combined Notification of Appeal Process (NAP) and Request For Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the North Atlantic Division Office at the following address:

James W. Haggerty, Regulatory Program Manager, CENAD-PD-OR
North Atlantic Division, U.S. Army Engineer Division
Fort Hamilton Military Community
General Lee Avenue, Building 301
Brooklyn, New York 11252-6700

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Park 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by APR 2 8 2015. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

This delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

It is strongly recommended that the development of the site be carried out in such a manner as to avoid as much as possible the discharge of dredged or fill material into the delineated waters of the United States. If the activities proposed for the site involve such discharges, authorization from this office may be necessary prior to the initiation of the proposed work. The extent of such discharge of fill will determine the level of authorization that would be required.

In order for us to better serve you, please complete our Customer Service Survey located at http://www.nan.usace.army.mil/Missions/Regulatory/CustomerSurvey.aspx.

If any questions should arise concerning this matter, please contact Brian A. Orzel, of my staff, at (917) 790-8413.

Sincerely,

Christopher S. Mallery, Ph.D.
Chief, Western Section

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Turk Hospitality Group	File Number: NAN-2014-01331-WOR	Date: FEB 27 2015

Attached is:		See Section Below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of Permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of Permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_permit.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

•ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the New York District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations (JD) associated with the permit.

•OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the New York District Engineer. Your objections must be received by the New York District Engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the New York District Engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the New York District Engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

•ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the New York District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

•APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the North Atlantic Division Engineer, ATTN: CENAD-PD-PSD-O, Fort Hamilton Military Community, Building 301, General Lee Avenue, Brooklyn, NY 11252-6700. This form must be received by the Division Engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the North Atlantic Division Engineer, ATTN: CENAD-PD-PSD-O, Fort Hamilton Military Community, Building 301, General Lee Avenue, Brooklyn, NY 11252-6700. This form must be received by the Division Engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

•ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

•APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the North Atlantic Division Engineer within 60 days of the date of this notice with a copy furnished to the New York District Engineer.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: Jodi M. McDonald U.S. Army Corps of Engineers, New York District Jacob K. Javits Federal Building New York, NY 10278-0090 (917) 790-8720	If you only have questions regarding the appeal process you may also contact: James W. Haggerty, Regulatory Program Manager, CENAD-PD-OR North Atlantic Division, U.S. Army Engineer Division Fort Hamilton Military Community General Lee Avenue, Building 301 Brooklyn, NY 11252-6700 (347) 370-4650 E-mail: James.W.Haggerty@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.	Date:	Telephone number:

ROBERT G. TORGERSEN, LA, CPESC
LANDSCAPE ARCHITECTURE AND ENVIRONMENTAL SCIENCES
THREE MAIN DRIVE, NANUET, NY 10954
Tel. 845 623 4835 Fax 845 627 6622 E-mail rtorger271@gmail.com
NYS LA LIC # 451
NJS LA LIC # 148
CPESC Cert. # 899

October 12, 2014

Dr. Chris Mallery, Chief – Western Permits Section
Regulatory Branch, New York District
USACOE
26 Federal Plaza 19th Floor
New York, New York 10278

Re: Jurisdictional Determination for Wildberry Lodge
By Turk Hospitality Group

Dear Mr. Mallery;

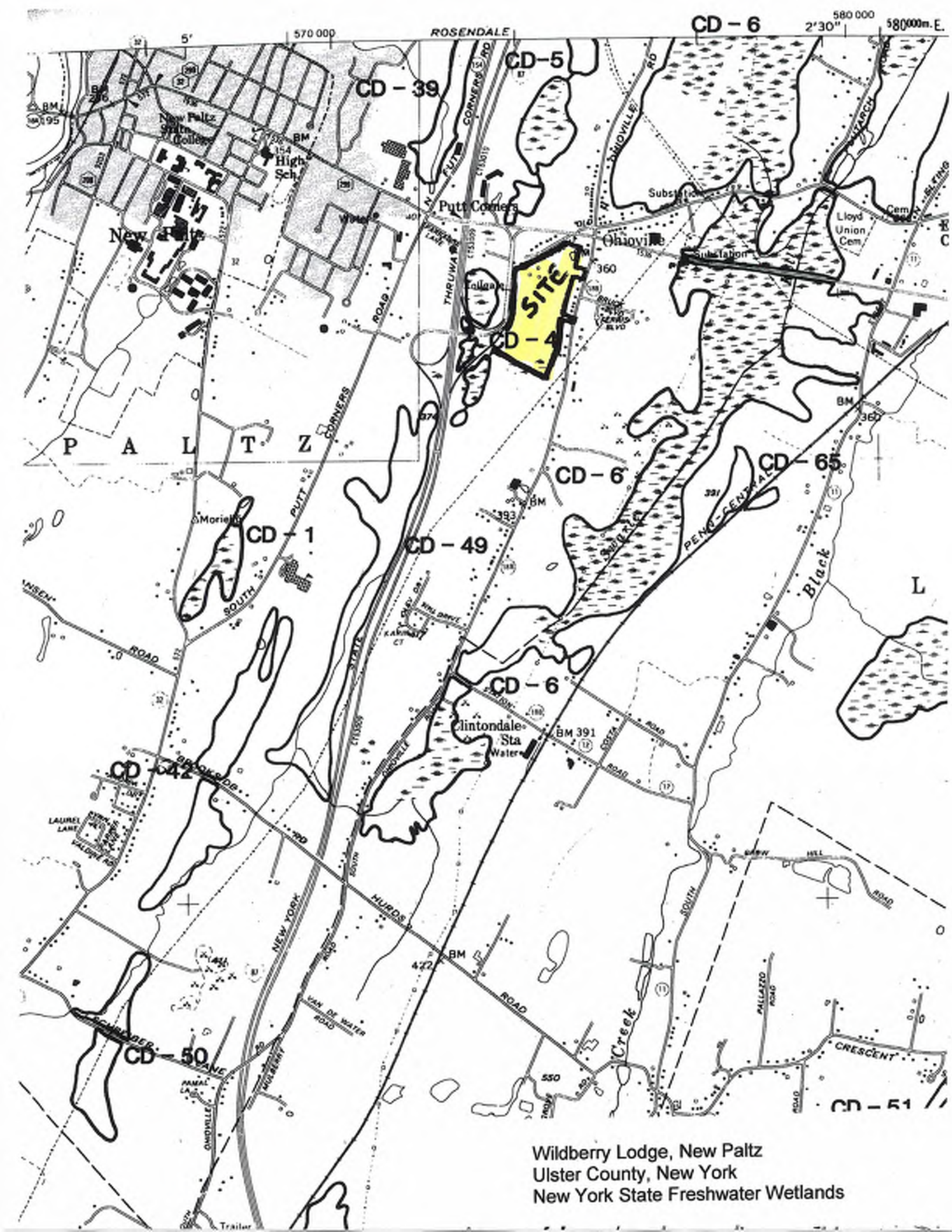
The above project is a 57.26 acre site in New Paltz, New York. The applicant is Turk Hospitality Group, 600 Route 44/45, Highland, New York 12528. The parcel is owned by Samuel Plesser, 5 Westford Street, Albany New York 12208. There are five distinct and separate wetland areas located onsite, of these we believe area E is isolated. The site work was done during November 2013 and May, 2014. The routine determination method was used to establish the wetland boundaries. Wetland areas A, C and E appear to be areas that were previously disturbed, the soils survey shows area A as a borrow pit. Area C certainly looks like an old excavation and area C has man made berms around its borders. Area D is successional field habitat and area B is successional mature forest. Areas A, B, C and D have drainage routes can be traced to the Wallkill River. We believe area E is an isolated wetland. The project site is about 6 river miles from the Wallkill River. From that point it is about 20 miles to the Rondout Creek and then only 5 river miles to the Hudson River itself. The entire site is in the Hudson River basin. There are no historic land uses for this site. There are no historic structures onsite. All onsite wetlands seem to be fed by ground water as there are no streams entering the site and very little contributing watershed offsite. There are a few man made ditches onsite but only the one included in the area A line had any flow during my two times onsite.

Included is a site survey both full sized and reduced, wetland data forms and site photographs. Please contact me if any additional information is needed.

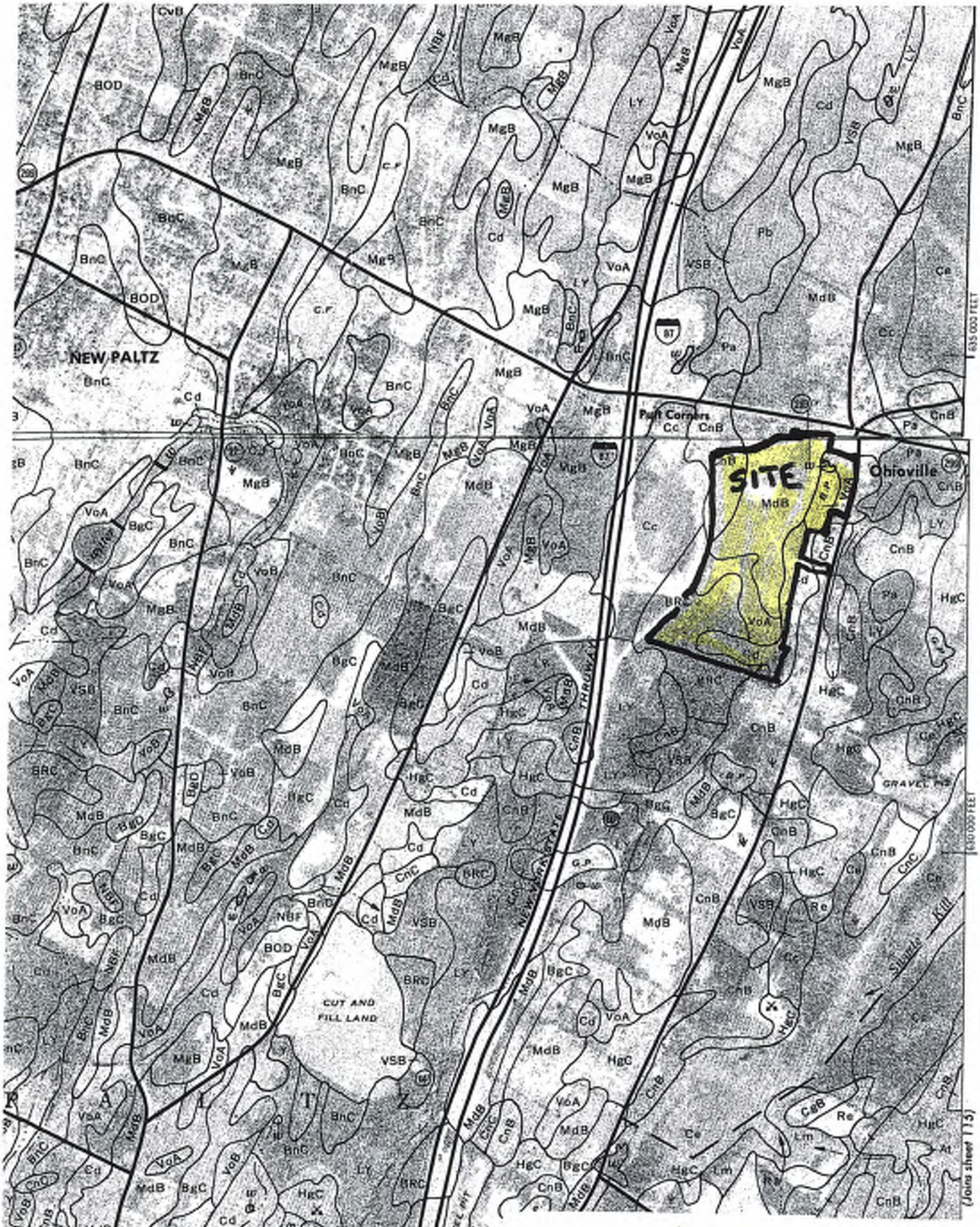
Yours truly

Robert G. Torgersen

Robert G. Torgersen



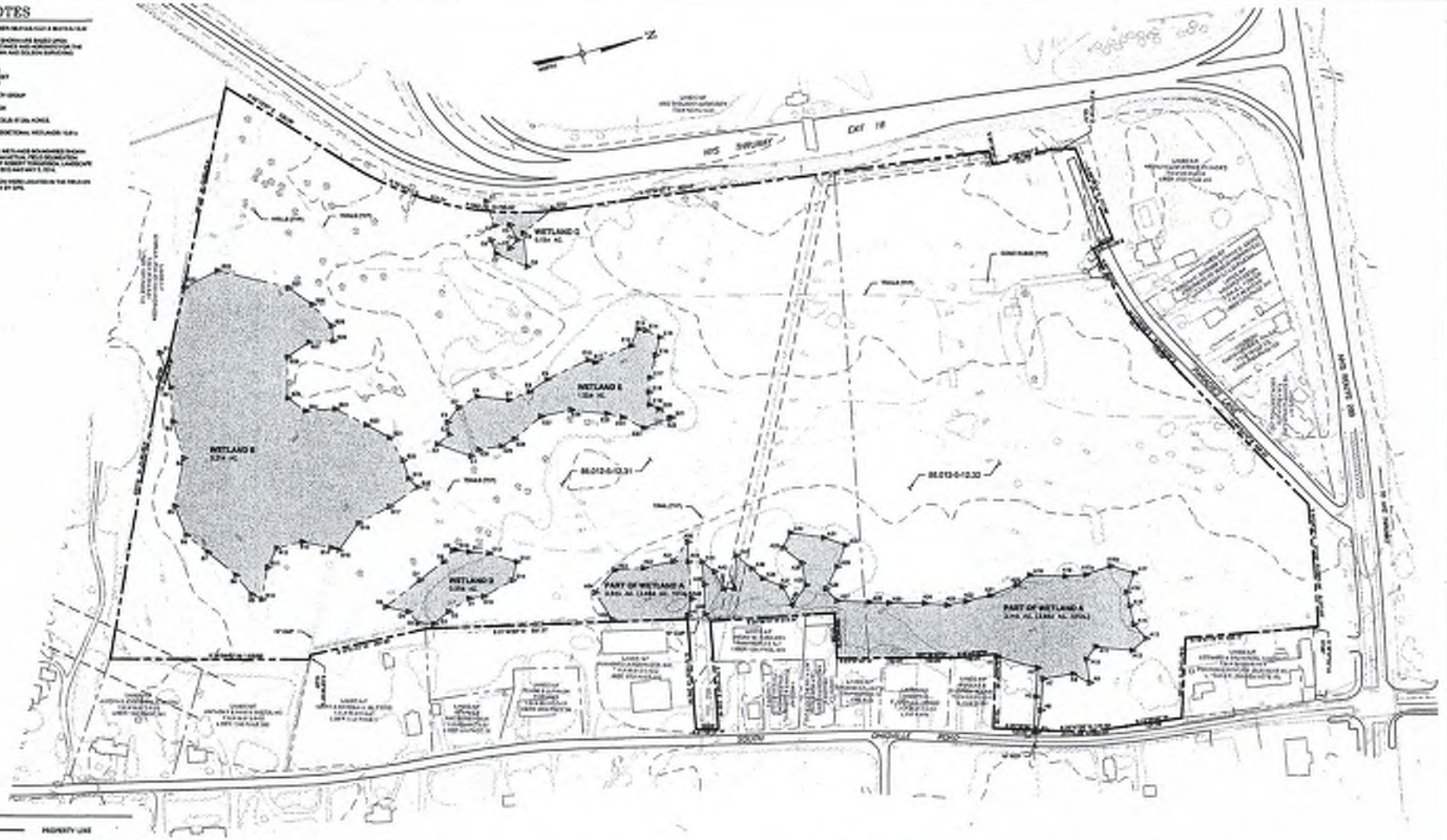
Wildberry Lodge, New Paltz
Ulster County, New York
New York State Freshwater Wetlands



Wildberry Lodge, New Paltz
Ulster County. New York
Soils Survey Of Ulster County

GENERAL NOTES

1. THE MAP IDENTIFICATION NUMBER (MUNICIPALITY & MAP) IS 0.14.
2. BOUNDARY AND TOPOGRAPHIC SHOWN ARE BASED UPON SURVEYS PERFORMED BY EUSTANCE AND HORNBOSTEL FOR THE SUBDIVISION PLAN IN MARCH 1994 AND GOLDEN SURVEYING SERVICES.
3. OWNER: MABEL PLESSIS
4. OWNER: TUSK HORTICULTY GROUP
5. TOTAL AREA OF SUBJECT PARCELS: 57.0± ACRES.
6. TOTAL AREA OF FEDERAL JURISDICTIONAL WETLANDS: 12.8± ACRES.
7. THE FEDERAL JURISDICTIONAL WETLANDS BOUNDARIES SHOWN HEREON ARE THE RESULT OF WETLAND FIELD DELINEATION PERFORMED BY THE OFFICE OF ROBERT FERGUSON, LANDSCAPE ARCHITECT (SO WOODWARD RD, ROSS AVE) ON OCT 5, 2016.
8. THE WETLAND BOUNDARIES SHOWN HEREON ARE LOCATED IN THE FIELD APRIL 28, 2011 AND JUNE 3, 2013 BY GPS.



LEGEND

- PROPERTY LINE
- ADJACENT PROPERTY LINE
- CONTOUR LINE
- INDEX CONTOUR LINE
- LIMITS OF EASEMENT
- WATER COURSE
- EDGE OF PAVEMENT
- EDGE OF WOODS
- LIMITS OF ACOE WETLANDS
- OVERHEAD UTILITY LINES
- UTILITY POLE
- ACOE WETLANDS FLAG

ACOE WETLAND AREA TABLE

DESCRIPTION	AREA (ACRES)
AREA "A"	3.68
AREA "B"	0.91
AREA "C"	0.10
AREA "D"	0.02
AREA "E"	1.99

No.	DATE	DESCRIPTION

DRAWING STATUS — DRAWING DATE: 12/31/11

THIS SHEET IS PART OF THE PLAN SET ISSUED FOR — SHEET NUMBER

CONCEPT APPROVAL	N/A	SHT	N/A
PLANNING BOARD APPROVAL	N/A	SHT	N/A
PRELIMINARY SUBDIVISION APPROVAL	N/A	SHT	N/A
FINAL SUBDIVISION APPROVAL	N/A	SHT	N/A
SITE PLAN APPROVAL	N/A	SHT	N/A
BUILDING PERMIT	N/A	SHT	N/A
BONDING		SHT	
FOR BID	N/A	SHT	N/A
FOR CONSTRUCTION	N/A	SHT	N/A

THIS PLAN SET HAS BEEN ISSUED SPECIFICALLY FOR THE APPROVAL OR ACTION NOTED ABOVE AND SHALL NOT BE USED FOR ANY OTHER PURPOSE. THIS SHEET SHALL BE CONSIDERED INVALID UNLESS COUNTERSIGNED BY ALL SHEETS OF THE SUBDIVISION PLAN SETS.

ALTERATIONS OR ADDITIONS TO THIS DOCUMENT BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

0 30 60 120

1 inch = 120 ft.

ENGINEERING & SURVEYING PROPERTIES

A.C.O.E. WETLAND DELINEATION MAP

WILDBERRY LODGE
NYS ROUTE 299 & SOUTH DRIVEWAY ROAD
TOWN OF NEW PALTZ
ULSTER COUNTY, NEW YORK

DRAWN BY: [illegible] — CHECKED BY: [illegible]
DATE: 12/31/11 — SCALE: 1" = 120'
JOB NO. [illegible]

ACOE-1

ROBERT G. TORGERSEN, LA, CPESC
LANDSCAPE ARCHITECTURE AND ENVIRONMENTAL SCIENCES
THREE MAIN DRIVE, NANUET, NY 10954
Tel. 845 623 4835 Fax 845 627 6622 E-mail rtorger271@gmail.com
NYS LA LIC # 451
NJS LA LIC # 148
CPESC Cert. # 899

Wildberry Lodge, Town of New Paltz, NY – Wetland photos

Photo # 1 – Ditch along East Property line

Photo # 2 – South end of area A

Photo # 3 – Wetland Area B

Photo # 4 – Forest part of wetland A

Photo # 5 – Wetland area D

Photo # 6 – Wetland area D

Photo # 7 – Wetland B – by flag B-9

Photo # 8 – Wetland area B

Photo # 9 – Wetland area E

Photo # 10 – Wetland area E

Photo # 11 – Wetland Area C – view west

Photo # 12 – Wetland area C – view to the east.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Wildberry Lodge City/County: New Paltz/Ulster Sampling Date: 11-23-13
Applicant/Owner: Plesser Tech Hospitality Group State: N.Y. Sampling Point: A
Investigator(s): Robert Torgerson Section, Township, Range:
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): concave
Slope (%): 1 Lat: 41.44-19.25 N Long: 74-03-27.79 W Datum: Google
Soil Map Unit Name: B.P. Borrow Pit / Canadaigua NWI classification: PFOIE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? NO Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
Scrub/shrub habitat within a borrow pit.
Facw/obl. plant community

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres on Living Roots (C3)
- ✓ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ____	Depth (inches): ____
Water Table Present?	Yes ✓	No ____	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): ____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Area flowing east under Ohio Road 20 acre watershed
6 river miles to Wallkill, 20 to Rondout, 5 to Hudson.
Hudson River Basin

VEGETATION – Use scientific names of plants.

Sampling Point: A

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. RED MAPLE			FAC
2. PIN OAK			FACW
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. SPICE BUSH			FACW
2. SILKY DOGWOOD			FACW
3. MULTIFLORA ROSE			FAC
4. HONEYSUCKLE			FACU
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. PHRAGMITES			FACW
2. CATTAIL			OBL
3. REEDCANARY GRASS			FACW
4. SOFT RUSH			FACW
5. TUSSOCK SEDGE			OBL
6. SKUNK CABBAGE			OBL
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ✓ Rapid Test for Hydrophytic Vegetation
- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
6"	5YR 5/1	80	5YR 5/4	20				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- X Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: clay

Depth (inches): 6

Hydric Soil Present? Yes ✓ No ___

Remarks:

mapped Canadaigua VPD. Mollic Hapludept

most of area is an old borrow pit/excavation

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Wildberry Lodge City/County: New Paltz/Ulster Sampling Date: 11-23-13

Applicant/Owner: Turk Hospitality Group State: N.Y. Sampling Point: B

Investigator(s): Robert Torgersen Section, Township, Range:

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none):

Slope (%): Lat: 41-44-03.69N Long: 74-03-37.35W Datum: Google

Soil Map Unit Name: Canadaqua NWI classification: PFO1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ✓ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ☒ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ____	Depth (inches): 3	
Water Table Present?	Yes ✓	No ____	Depth (inches): 6	
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 9	Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

ground water fed - no obvious source 8 acre watershed flows east, 5 river miles to Wallkill River, 20 river miles to Rondout Creek, 5 river miles to Hudson

Wildberry Lodge

VEGETATION – Use scientific names of plants.

Sampling Point: B

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. White Oak			FACW
2. Red Maple			FAC
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. Highbush Blueberry			FACW
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. Tussock Sedge			
2. Sensitive Fern			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- [X] Rapid Test for Hydrophytic Vegetation
- [ ] Dominance Test is >50%
- [ ] Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

FACW dominant plant community

SOIL Wildberry Lodge

Sampling Point: B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	5YR 3/1	100						topsoil
8-16	5YR 6/1	90	5YR 4/4	10				clay

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- X Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: clay

Depth (inches): 8

Hydric Soil Present? Yes ✓ No ___

Remarks:

mapped Canadaigua - Mollic Haplaquept

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Wildberry Lodge City/County: New Paltz/Ulster Sampling Date: 11-23-13
Applicant/Owner: Turk Hospitality Group State: N.Y. Sampling Point: C
Investigator(s): Robert Torgersen Section, Township, Range:
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none):
Slope (%): Lat: 41-44-10.14 N Long: 74-03-42.73 W Datum: Google
Soil Map Unit Name: Voa Valusia NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
run off collection area
facw dominant plant community

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ✓	No ___	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
exposed roots
bare soil
drainage patterns
•
6 acre watershed
5 r. miles to Wallkill River
20 r. miles to Rondout Creek
5 r. x or miles to Hudson River

Wildberry Lodge

VEGETATION – Use scientific names of plants.

Sampling Point: C

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Red Maple			FAC
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. Honeysuckle			FACU
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. SENSITIVE FERN			FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- [x] Rapid Test for Hydrophytic Vegetation
- [ ] Dominance Test is >50%
- [ ] Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (Include photo numbers here or on a separate sheet.)

small wetland; small species count

Willberry Lodge

SOIL

Sampling Point: C

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
10	10YR 5/2	80	10YR	20				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- X Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: clay

Depth (inches): 10

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Wildberry Lodge City/County: New Paltz/Ulster Sampling Date: 11-23-13

Applicant/Owner: Turk Hospitality Group State: NY Sampling Point: D

Investigator(s): Robert Jorgensen Section, Township, Range:

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Concave

Slope (%): Lat: 41-44-07.67 N Long: 74-03-32.78 W Datum: Google

Soil Map Unit Name: Canadaqua NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation , Soil , or Hydrology naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No	Is the Sampled Area within a Wetland? Yes ✓ No
Hydric Soil Present?	Yes ✓	No	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ✓	No	

Remarks: (Explain alternative procedures here or in a separate report.)

low area with FACW dominant plant community + Hydric Soil Chromas

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☒ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No	Depth (inches):	
Water Table Present?	Yes ✓	No	Depth (inches): 14	
Saturation Present? (includes capillary fringe)	Yes	No	Depth (inches):	Wetland Hydrology Present? Yes ✓ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

low lying area - ground water/run off fed connects to man made ditch along prop. line.

5 river miles to Wallkill River, 20 river miles to Rondout Creek

5 river miles to Hudson River

Wilbert Lodge

SOIL

Sampling Point: D

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1							
4	10YR 4/1	95	10YR 4/4	5				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ✓ Stratified Layers (A5)
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: clay

Depth (inches): 4

Hydric Soil Present? Yes ✓ No ___

Remarks:

Volusia - Aeric Fragiaquept

VEGETATION – Use scientific names of plants.

Sampling Point: D

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. PIN OAK			FACW
2. RED MAPLE			FAC
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. TUSSOCK SEDGE			OBL
2. SOFT RUSH			FACW+
3. REED CANARY GRASS			FACW+
4. SENSITIVE FERN			FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☒ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

scrub/shrub habitat successional field?

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Wildberry Lodge City/County: New Paltz/Ulster Sampling Date: 11-23-13

Applicant/Owner: Turk Hospitality Group State: NY Sampling Point: E

Investigator(s): Robert G. Tagliarini Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): concave

Slope (%): 0 Lat: 41-44-09.95 N Long: 74-03-36.89 W Datum: Google

Soil Map Unit Name: Volusia NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? NO Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

mapped (NWI)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☒ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☒ No ____ Depth (inches): 1

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

depression type W/L

10 acre watershed

VEGETATION – Use scientific names of plants.

Sampling Point: E

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. RED MAPLE			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. HIGHBUSH BLUEBERRY			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. SENSITIVE FERN			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Rapid Test for Hydrophytic Vegetation

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: E

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1							
4-12	10YR 5/1	95	10YR 3/4	5				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ☑ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

This page is intentionally left blank.